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Y.E.S. QUARTERLY

YOUNG ENTOMOLOGISTS' SOCIETY

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Drawing by Todd Lawton, Winnipeg, Manitoba

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YOUNG ENTOMOLOGISTS' SOCIETY

Y.E.S. QUARTERLY

INFORMATION FOR AUTHORS

Manuscripts and original artwork on any insect or Arthropod-related topic are welcome for publication in Y.E.S. QUARTERLY. Articles with special interest to young entomologists will receive publication priority. Manuscripts may be of any length, but should be double-spaced and typed (or neatly written). Photographs or maps should be done in black and white, and any drawings, charts, or graphs or maps should be done in black ink and should fit in the new page size. All authors should supply a title for their article and a complete mailing address. We're sorry, but no page proofs can be furnished.

Other features, including news, field notes, book reviews or other illustrations, are also accepted and will be used when space is available. Members may submit short "advertisements" for the "Trading Post" section, describing their special desires for information, correspondence or specimens. All ads will be edited for brevity and acceptability and their inclusion will be made on a space-available basis.

Send to: Young Entomologists' Society, c/o Department of Entomology, Michigan State University, East Lansing, MI 48824-1115 USA.

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NEWS SOCIETY NEWS & BUSINESS

INTRODUCTION

I think you will all be pleased with this issue of YES QUARTERLY. It is full of fine articles, information and illustrations. As usual, there has been a lot of activity since our last issue of the journal, so I want to take this opportunity to bring you up to date.

MEMBERSHIP QUESTIONNAIRES

Thanks to all of you who took the time to complete the questionnaire enclosed with your 1986 renewal materials. We had about a 35% response. (If you would like to express your opinion, its still not too late! I have more questionnaires if you need one.) The results of the questionnaire can be summed up as follows: members favor having an annual meeting by 2 to 1; 62% of the members are interested in having a collecting trip, and most favor having it in combination with an annual meeting (it is not surprising that 88% favored a summer meeting). The membership was evenly split on the idea to offer free memberships to senior citizens; however there was a 2 to 1 majority in favor of offering a small discount. The idea of producing either a patch or decal is highly favored by members, 8 to 1. There was also some sentiment towards development of a T-shirt for members. There were a lot of good comments and ideas contained on the questionnaires, and as soon as I can digest them all we will initiate the necessary improvements to our journal, programs and services.

MEMBERSHIP CHANGES

We continue to enroll new members. However, we also failed to enroll almost 75 members again this year. There are probably a lot of reasons for this, including dissastisfaction, forgetfulness, and moving without leaving a forwarding address, to name a few reasons. Because of constant coming and going of some members it's hard for me to give you an accurate count of our membership, but we're somewhere in the 400 to 450 member range.

I am proud to announce that we have several new sustaining members. They are: Wayne Decker, Alexandria, IN; Anna M. Edling, VMD, North Wales, PA; Veronica Mercado, St. Bernard, PHILIPPINES, Richard Wilkey, Bluffton, IN, and Michael Mayer, Recklinghausen, FRG. We thank these sustaining members for their support of YES above and beyond the call of duty!

SOCIETY PROMOTION

So far this year I have sent out almost 200 letters promoting our Society. We also receive a lot of inquiries and referrals from YES members and other entomologists. I have had a revised printing of our promotional brochure done. This third printing is done on green paper; the first was on gold and the second on yellow (so you can distinguish this most recent version from the older, out of date ones). 400 copies of this brochure have arrived in Nairobi, KENYA (Africa) and will be distributed at the upcoming International Conference on Tropical Entomology.

SWAP BOX PROGRAM

The first round of the experimental Swap Box Program is completed, and it seems to have worked out very well. The participants (nearly a dozen YES members) were recently questioned for their feedback, and small improvements to the program will no doubt be instituted before we undertake round two. I am hopeful that more YES members will want to take part in this unique YES service. See YES QUARTERLY 2(3):8 for details.

WRITING CONTEST

By now you all should have heard about the 1986 YES Writing Competition (see YES QUARTERLY 3(1):2 for details). I hope you are working on YOUR entry. We have some really great prizes for the winners, so I know you won't want to miss out on this opportunity for fame and fortune! Winning essays will be published in YES QUARTERLY, of course. The deadline for entries is June 1, 1986.

Speaking of contests, I am still accepting puzzle solutions from the Winter issue of the journal in exchange for some surprise entomological gifts. See the Winter issue for details.

YES PUBLICATIONS ERRATA

This is a section that I someday hope to eliminate from the journal. We are striving for perfection in our publications, but sometimes little "bugs" creep in when we're not looking! Member Directory: a number of format errors have been reported, but fortunately these don't detract from the overall usefulness of the directory. There are, however, some errors in an ocassional address or two, so use the directory with caution!

Winter Issue of YES QUARTERLY: the clue "spider" is missing from the list on page 56; in the article on page 14, Suzumuski should have been Suzumushi, Samurae is Samurai, and Kabutomuski should have Kabutomushi! Our apologies to the authors!

NEW VOLUNTEERS

We have had nearly a dozen volunteers sign up to serve other YES members as SECTION ADVISORS. Please make a note of these new YES volunteers in your member directory. They have pledged to assist you with your entomological questions and problems.

Section 2: General Entomology - Armstrong, Bezark, Harmon, Havranek, and Hoover (see addresses below).
Section 4: Aquatic Insects - Bridge, Hafar, Hoover and Stiles.
Section 5: Orthoptera and Relatives - Harmon (cockroaches).
Section 7: Coleoptera - Bezark, Havranek, Hoover, and Isgro.
Section 8: Lepidoptera - Ianni and Hoover.
Section 9: Diptera - Bezark.
Section 10: Hymenoptera - Bezark.
Section 11: Techniques - Bridge, Harmon, Singh (rearing) and Stiles.
Section 12: Applied Entomology - Harmon.

New Section Advisors - Names and Addresses:

Mandie Armstrong
P.O. Box 658
Ballinger, TX 76821 USA

Larry G. Bezark
521 46th Street
Sacramento, CA 95819 USA

Ryan A. Bridge
4329 Old Orchard Road
York, PA 17402 USA

Bert Hafar
P.O. Box 621
Seiad Valley, CA 96086 USA

Jim Harmon
Dept. of Entomology
VPI and State Univ.
Blacksburg, VA 24060 USA

Daniela Havranek
U.N.E.T., Apartado 436
San Cristobal, Tachira
VENEZUELA

Gregory A. Hoover
RD #4, Box 171
Halifax, PA 17032 USA

Francesco Isgro
2002 Wellfleet Court
Falls Church, VA 22043 USA

Brad Stiles
Biochemistry Dept., MSU
Bozeman, MT 59717 USA

Connie Ianni
P.O. Box 81171
Cleveland, OH 44181 USA

Dr. Pritam Singh
Entomology Div., DSIR
Mt Albert Research Centre
Private Bag, Auckland
NEW ZEALAND

MAIL BAG

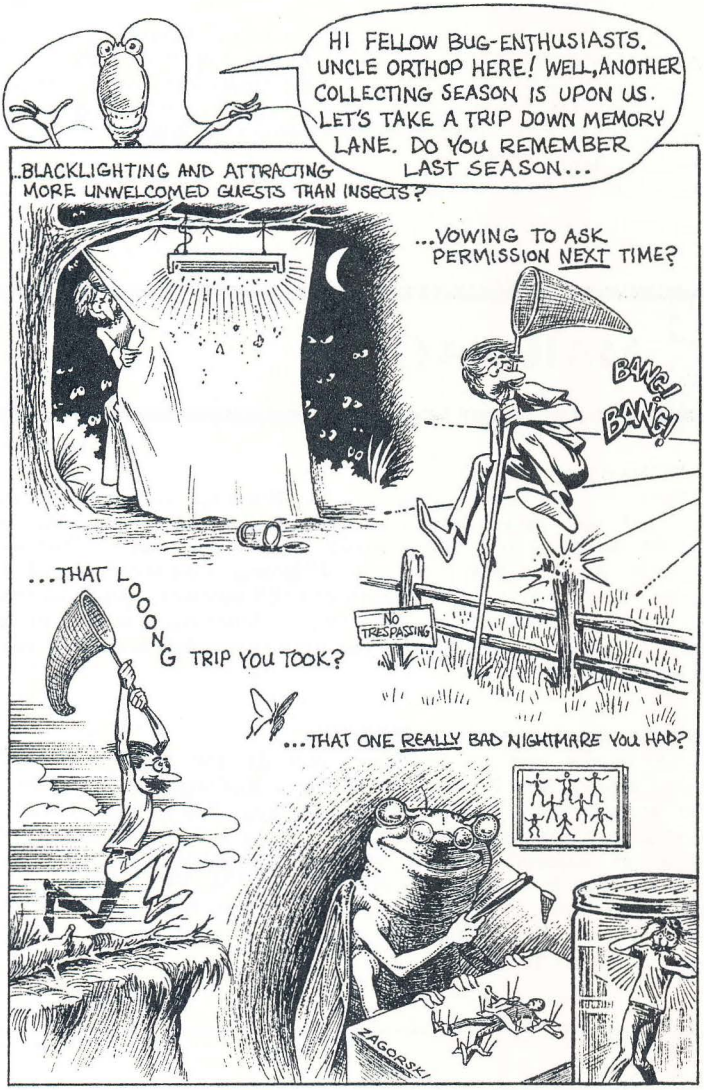
PUBLICATIONS BY MEMBERS

The Society still has copies of "A Planting Guide for Virginia Nectar-Seekers" by Patricia Purdy (YES member) and Jeffrey M. Curtis. Write to YES Headquarters if you would like a free copy. "Distribution and medical ecology of the blow flies (Diptera: Calliphoridae) of Peru" was recently published by D.L. Baumgartner (YES member) and B. Greenberg in the Annals of the Entomological Society of America. I'm sure either of the authors could supply a reprint if you were interested (see your member directory for Donald's address).

1986 XERCES SOCIETY ANNUAL MEETING

This important meeting is being held at the Pilgrim Firs Camp Conference Center, Lake Flora, Port Orchard, Washington (USA) from June 4-8. The program will feature invited papers, workshops, special slide presentations, exhibits, and field trips. There will also be an auction of butterfly art objects. Anyone wishing to present a paper or to just attend the meeting is invited to contact Robert M. Pyle, Xerces Meeting Chairman, Swede Park, 369 Loop Road, Gray's River, WA 98621 USA (Phone: 206-465-2539). (YES headquarters also has a copy of the conference announcement and call for papers.)

Michael Zagorski, Warrenville, IL



Michael Zagorski, Warrenville, IL

Safety Tips for Insect Collectors

Gary A. Dunn
Department of Entomology
Michigan State University
East Lansing, MI 48824-1115 USA

Safety may seem like an unusual topic for an entomological journal, bit when you really stop and think about safety, it really is an appropriate topic. Using good safety practices while in the field collecting insects is as important as using such practices while at home or anywhere else! I suppose that many of the ideas that I hope to share with you might be categorized as "common sense", but it is surprising how many people loose sight of common sense when they encounter unfamiliar or hazardous situations. Since preparation is the key to safety and accident prevention, I hope that you will take the time to read this article, and the one that follows on first aid, and remember to be safety conscious when in the great out-of-doors. Incidentally, this article is not meant to be a comprehensive, exhaustive work on the subject of safety. It is intended to make a few useful suggestions, and no more. If you would like further information on the subject of safety I suggest you contact your local safety council or similar organization.

ADVANCE PREPARATION. There are a few things you must do before you leave on your collecting expedition. If it is at all possible, arrange to go collecting with at least one other person. This becomes absolutely necessary when you are planning a trip into unfamiliar territory, or planning to travel long distances. If you were to go collecting alone and something should happened to you, an otherwise manageable bad situation could easily turn into a life-threatening situation without the assistance of a collecting partner (or two). I also suggest that you take the time to learn a few of the basic elements of emergency first aid if you spend large amounts of time collecting in remote areas. Additionally, understanding the use of a map and compass is also an important talent and it could save you lots of time and trouble. Just before your departure, leave a copy of your plans and itinerary with a relative, friend or colleague. It is important that you tell them where you're going, who you're going with, and when you plan to return. This is vital information to help authorities find you of you become lost, stranded or injured and fail to return home.

WHILE IN THE FIELD. Be smart, learn to recognize and avoid hazardous situations. Be especially watchful for dangerous animals (especially the venomous kinds), poisonous plants, deep waters, and developing severe weather conditions. In addition to your collecting gear you should carry a small, personal first aid kit, and in the case of group expeditions, a larger, more comprehensive kit. Be sure that your kit includes some emergency coins in case you need to use a pay telephone!

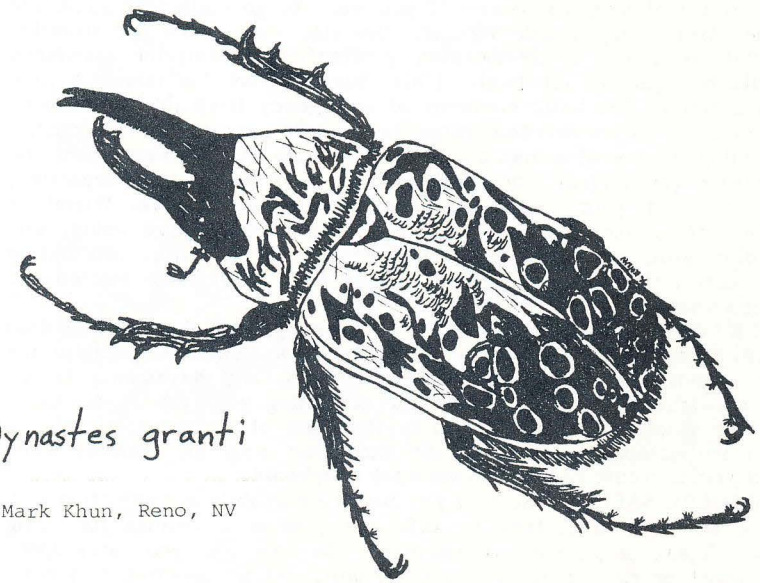
VEHICULAR SAFETY. Many of you use an automobile in connection with collecting so it is important to talk about some guidelines for using vehicles. Again, preparation is essential! Be sure that you carry spare parts: a quart or two of motor oil, a fan belt, and an assortment of nuts, bolts and screws. How about the spare tire and jack? Are they in the vehicle and ready to use. How about a spare set of keys, just in case you loose the original set? You should also carry an assortment of tools. A selection of screwdrivers, wrenches, pliers and a hammer are the bare minimum.

Some collectors, myself included, use a 4-wheel drive vehicle to get them into the real outback for collecting. This necessitates some additional safety precautions. Since you will be in remote areas you might want to consider carrying a survival kit in addition to the normal first aid kit. A survival kit would include matches, a candle, flashlight, fish hooks, rope, a blanket, and a small supply of food and water.

In addition to the tools that should normally be carried in any vehicle, operators of 4WD vehicles should also carry a shovel, a winch, a chain, and an axe or saw. I also carry a small air compressor to inflate tires, and this has proven to be one of the best investments I have ever made. It has saved me from a long walk more than once! Some 4WD operators even go so far as to carry some putty to patch holes in gas tanks and oil sumps.

No matter what type of vehicle you drive in off-road situations, you must use extreme caution. Watch for and anticipate hazardous conditions such as soft ground, unstable embankments, fords, and the like. When you encounter a questionable bit of terrain, stop and look the situation over BEFORE you attempt to traverse the area. Even 4WD vehicles should expect to get stuck from time to time, so know how to extricate yourself with the tools you're carrying.

I assure you that if you follow these guidelines you will dramatically reduce the chance of accidents and injuries, and if you should encounter any hazardous situations you will be equipped to minimize the danger and inconvenience. I hope that all YES members will become safety-conscious collectors!



Dynastes granti

Mark Khun, Reno, NV

First Aid for Insect Collectors

Kristi L. Dunn, R.N.
5727 Pine Ridge Drive
Haslett, MI 48840 USA

If you spend any amount of time in the field collecting insects there are bound to be injuries to you or your collecting partners. Hopefully any injuries that you receive will be minor ones, such as cuts or bruises. Since there is a chance that you could be injured any time you go out collecting, it is advisable that you be prepared for the worst!

Everybody should seek instruction in emergency first aid and cardiopulmonary resuscitation (CPR). Also, take the time to learn about the safety practices that help prevent accidents and injuries. (Editor: See the preceding article on safety guidelines.) You should also assemble a first aid kit to carry with you in the field in case of an emergency.

An inexpensive first aid kit can be made out of a 3 pound coffee can with a tight-fitting plastic lid. The can should be painted a bright color and clearly marked "FIRST AID KIT"; you may even want to add a big red cross (a sort of universal symbol).

Suggested contents for a first aid kit:

50 - assorted adhesive bandages ("band-aids")
2 - 3 inch bandage compresses
1 - 4 inch bandage compress
12 - 3 x 3 inch gauze pads
4 - 2 inch roller bandages
3 - medium-sized surgical dressings
1 - pair blunt-tipped scissors
3 - triangular bandages
1 - pair of tweezers (forceps)
1 - bottle antiseptic solution
- coins for emergency phone calls
1 - roll of adhesive tape

A first aid kit designed for a group expedition should have a larger quantity of the above listed items; you may want to include a tourniquet in the list, also. Some people carry over-the-counter medications such as aspirin (or a non-aspirin substitute), allergy pills, antacids, etc.

Generally speaking, in case of accident or injury you should follow these guidelines: (1) assist the injured; render what first aid you can; make the victim as comfortable as possible. (2) do not move seriously injured victims unless absolutely necessary. (3) send for help as soon as possible.

Basic First Aid Procedures

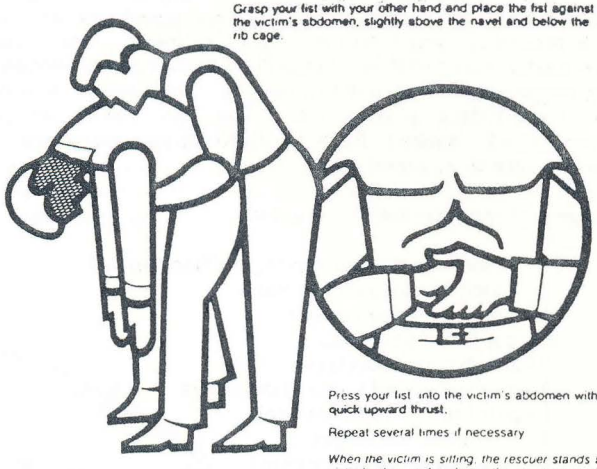
LIFE THREATENING EMERGENCIES:

(A) Choking (conscious victims)

1. If the victim CAN speak, cough or breathe do not interfere.
2. If the victim CANNOT speak, cough, or breathe you must render assistance:
   a. Give 4 quick back blows between the shoulder blades.
   b. If unsuccessful, give 4 upward abdominal thrusts.
   c. Repeat this sequence until the airway is cleared or medical help arrives.

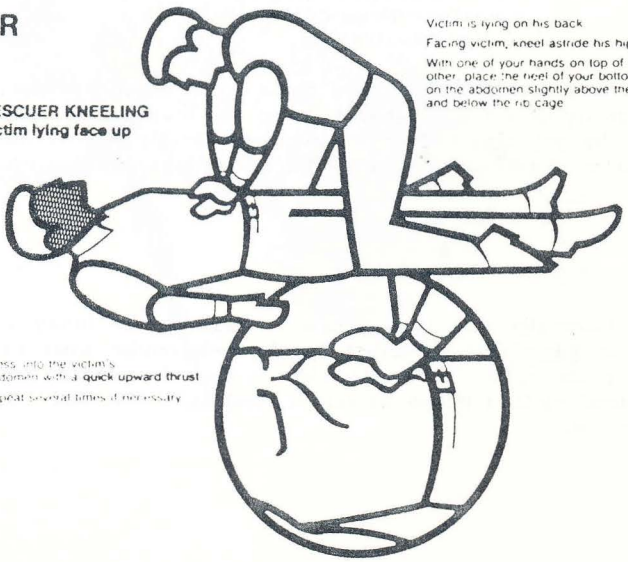
NOTE: See the "Heimlich Maneuver" illustration

RESCUER STANDING
Victim standing or sitting



OR

RESCUER KNEELING
Victim lying face up



(B) Respiratory Arrest

1. See figure 2, "When Breathing Stops".
2. For cardiac emergencies ("heart attack") only those persons with training in CPR will be able to effectively restore breathing and circulation. Therefore it is recommended that everybody take a course in this vital first aid procedure.

(C) Severe Bleeding

1. When blood is gushing from a wound, apply direct pressure over the wound with your hand to stop the bleeding. With your free hand, or with the assistance of another person tear a piece of clothing for a bandage. Any clean cloth, a sanitary pad, or a handkerchief will do until a sterile dressing is available. If the dressing gets blood-soaked, DO NOT remove it. Apply more bandages over the top of the dressing and maintain pressure on the wound.
2. If pressure cannot be applied directly over the site of the wound (as in a compound fracture), apply pressure to the supply blood vessel above the wound. Tourniquets are rarely needed, and should only be used in extreme cases because they may cause further damage resulting in the loss of the arm or leg.

GENERAL FIRST AID PROCEDURES

(A) Poisoning by mouth

1. For the conscious victim who is not having convulsions:
   a. Give victim water or milk. A teaspoon of baking soda in a glass of water will neutralize acids. A tablespoon of vinegar will neutralize lye (alkali).
   b. Save the label (container) or a sample of the suspected poison that has been ingested. Also, have a sample of any material the victim vomits.
   c. Call a physician or poison control center for further instructions.

2. For the unconscious victim:
   a. Call for medical help as soon as possible.
   b. Maintain an open airway by tipping the victim's head back.
   c. If victim vomits, turn victim to his side to prevent aspiration of any fluids.
   d. It may be necessary to administer CPR if breathing or circulation stops.
   e. Save the container or sample of the poison and any vomited material.
   f. DO NOT give fluids to an unconscious victim.

3. DO NOT try to make an unconscious person vomit; DO NOT induce vomiting when the victim has swallowed strong acids, alkalis or petroleum products.

(B) Bites

1. Poisonous snake bites:
   a. Have the victim lie down and remain quiet and calm. The affected part of the body should be lower than the rest of the body, if possible.
   b. If the wound is on an arm or leg, apply a constriction band (NOT a tourniquet 2 to 4 inches above the wound to slow the circulation. The band should be tightened moderately to allow the fingers to be pushed between the skin and the band. It should be loosened for 30 to 60 seconds every 15 minutes.
   c. Apply cold packs to affected area to relive pain and possibly delay the spread of snake venom into body tissues.
   d. Transport patient lying down. Since some hospitals do not stock antivenin, it is important to notify the hospital that you are bringing in a snakebite victim. This will give the hospital some lead time for locating and transporting the necessary antivenin.

2. Animal bites:
   a. Clean the wound with soap and water.
   b. Seek medical assistance as soon as possible. Animal bites are associated with a high incidence of infection and potential complications if not treated adequately.

3. Bee stings and insect bites:
   a. Those persons allergic to insect stings and bites should wear an emergency medical identification bracelet and carry an emergency insect treatment kit when in the field.
   b. Any time you are stung immediately remove the stinger and poison sac by gently scraping with your thumbnail. Do not squeeze the sac by trying to pull it out.
   c. For normal stings, 1/4 teaspoon meat tenderizer mixed with a teaspoon of water and rubbed onto the skin will relieve the discomfort
   d. If you experience anything other than a localized reaction, seek medical attention immediately.

(C) Foreign body in the eye

1. DO NOT rub the eye!
2. Try to make the foreign body lodge on the inside of the eyelid.
3. Roll back the eyelid and remove the object with a cotton swab or soft cloth.
4. If the object is, or becomes, embedded, close the eye and bandage shut. Seek medical attention.

(D) Wounds

1. Abrasions (usually caused by falls on hard surfaces)
   a. Inspect wound to be sure it is superficial.

b. Flush wound under running water, then wash with soap and water or an antiseptic, removing surface and embedded dirt.
c. If wound is small, leave it open to dry and form a scab. For larger wounds, you may want to apply an antiseptic ointment to help prevent infection.
d. For larger wounds, or those located in an area that is constantly rubbed, cover with a light bandage.

2. Lacerations
   a. Control bleeding by applying pressure to wound with a clean cloth.
   b. Clean with soap and water to remove dirt.
   c. Apply antibiotic ointment. Cover wound with adhesive bandage or gauze dressing.
   d. Seek medical attention if the wound needs suturing or if the person hasn't had a tetanus injection within the last five years. (NOTE: laceration several inches long and 1 to 2 inches deep usually need to be sutured. Those lacerations which are close to a bone are especially prone to infection.)

3. Puncture wounds
   a. If wound is bleeding, let it bleed freely for several minutes to help remove dirt (or saliva if from an animal bite).
   b. Clean wound with soap and water.
   c. Cover wound with a light dressing to prevent further contamination. Seek medical attention for further treatment.

(E) Burns

1. If skin reddens or blisters develop, immerse burned area in cool water or apply cool wet packs.
2. If the blisters break and there is an open wound with extreme pain, cover the area with dry, sterile dressing and seek immediate medical attention. Remove clothing from area if possible to prevent trapping heat next to skin. DO NOT apply greasy or oily substances!
3. If burned area is whitish, leathery-looking (possibly darkly charred), and there is little or no pain, cover the area with sterile dressings and transport victim to medical facility immediately. This type of victim may experience shock. Signs include pallor, weak pulse, sweating, and lethargy. If so, keep victim lying down and maintain body heat by with a light covering (it is better if the victim is slightly cool rather than too warm).

(F) Heat exhaustion

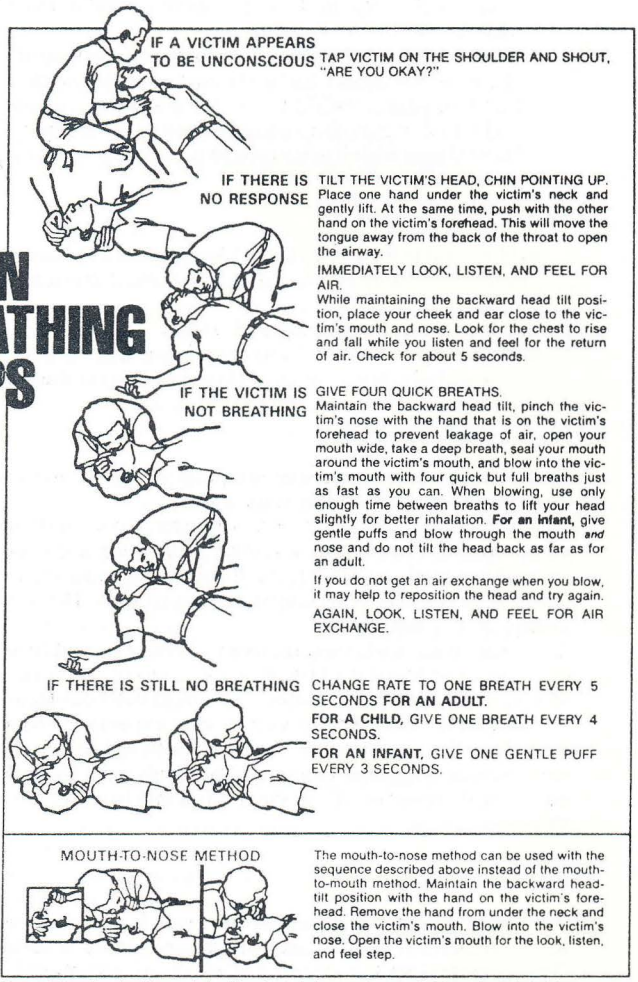
1. Symptoms: In severe cases perspiration is profuse; weakness, pale and clammy skin, nausea and temperature is normal.
2. Treatment: Give the victim a drink of salt solution (1/2 teaspoon salt in a glass of water) every 15 minutes for a total of 4 doses. Products such as Gatorade-brand drink are also good for supplying salt and electrolytes to prevent dehydration.

3. Have the victim get plenty of rest.
4. If there is no improvement, seek medical attention.

(G) Sprains and fractures

1. DO NOT move the victim (unless absolutely necessary due to another life threatening situation). If the victim must be moved, support the broken limb by making it immovable between two well-padded splints. These splints should be longer than the bone they are meant to support.
2. Elevate the limb above the level of the heart to minimize swelling. Apply cold packs to the injured area. Seek prompt medical attention.

FIGURE 2



For more information about these and other life saving techniques, contact your Red Cross chapter for training.

American Red Cross ARTIFICIAL RESPIRATION

A NEW HIERARCHICAL SYSTEM OF ARTHROPODA, MAINLY REFERRING TO INSECTS

(Presented at the XVII International Congress of Entomology in Hamburg, Federal Republic of Germany, the 20th of August, 1984)

Prof. Dr. Mircea-Alexandru Ienistea
Str. Caraiman 108
RO 78229 Bucarest 2
ROMANIA

To the prominent zoologist, Prof. Dr. Dr. Bernhard Rensch (Munster), as an expression of my acknowledgment for having showed me, by means of his publications, the right way in taxonomy.

Motto: "Die organische Natur richtet sich ebensowenig wie die Sprache nach eine Schulgrammatik, sie lasst sich nicht in starke Regeln und in ein streng abgezirkeltes System azwangen. Sie lasst sich nicht schablonisiren...

Eine dichotomische Aufspaltung der Organismen nach einzelnen Charakteren hat fast immer zu kunstlichen Systemen und unnaturlichen Gruppen gefuhrt." (A. Handlirsch, 1925)

The animal world, in its endless diversity, systematics, and distribution in space and time, has captured my interest since my earliest youth, as a schoolboy, and grew in to a lifelong, undiminished scientific business. Since that time, sixty years ago the beetles are of particular attraction and became my special field of investigation. I continuously paid the greatest attention to the permanent evolution of the taxonomical concept in every animal group, aiming to realize the integration of their particular classification in that of the whole realm.

As it is known, the classification system of the animal realm is continuously evolving, but very unequally in its different departments of the Invertebrates.

My first knowledge of classification, acquired as a schoolboy and later as a student of natural sciences, corresponded to that contained in the textbooks of Zoology during the '20's, when animals were distributed in 7(8) types (or phyla): Protozoa, Coelenterata, Echinodermata, Vermes, Mollusca, Arthropoda, Vertebrata. It must be nevertheless mentioned, as particularly progressive for his time, the classification of A. Sedgwick (1898), as well as A. Handlirsch's one (1919), more adequate than most of those offered by well-known textbooks.

During the following decennia, we had to learn, step by step, a continuous dissociation of almost all large animal groups earlier considered as phyla, with simultaneous emancipation of the subordinated categories to phylum-rank, this process increasing the number of the former from 7(8) to about 36 at present.

By splitting the earlier collective phylum "Vermes", no less than 13 independent phyla were erected: Acanthocephala, Sipunculida, Echiurida, Entoprocta, Pogonophora, Linguatulida, Tardigrada, Onychophora, and others, became separate phyla. The Graptoliths, formerly belonging to Coelenterata, were moved to the other end of Invertebrata, among Hemichordata. Meanwhile in every taxonomic category various groups continuously moved in every direction changing place, category or rank (or all of them) often leading to the

alteration of important parts of the whole system. While in Kukenthal's "Zoologisches Praktikum", eighth edition (1920) the animal world was distributed in 8 phyla, in the fourteenth edition of the same book, edited by E. Matthes (1959), the number of phyla increased to twenty-six. Meanwhile the number of classes and orders grew in parallel as well.

When considering the system of the present animal world as a whole, we have to keep in mind this: the original constitution of this world in its unimaginable complexity will remain unknown; it is for ever lost, as a result of successive catastrophic events occurred all over the planet over several hundred millions years. The majority of the animal species, as well as whole groups, were rooted out, most of them without leaving traces of their existence (or at best only fossil fragments of their bodies). Many peculiar structural types remain totally unknown. The number of the extinct forms is not known, but is no doubt vast. All we have at the present time are but remainders, some of them wholly and very isolated strings, lacking conspicuous relations to other known groups (neither living or extinct).

Consequently, the animal world is best described as a gigantic living mosaic, having been damaged by successive cataclisms. Although still extant, it presents countless more or less extended lacunae as a result of lost little stones. To arrange these fragments into a reasonable system, better than the previous one, is the task of the phylogenetic taxonomist.

The gigantic animal "phylum" Arthropoda, as a whole and in some of its constitutive parts, has also been continuously investigated by all kinds of zoologists; nevertheless it has maintained its general heterogeneous outlook, varying from one zoologist's concept to another. Actually, Arthropoda is nothing more than a collective term of manifold contents; likely "Vermes", "Myriapoda", and even "Insects", originated by an artificial assemblage of heterogeneous animal groups. Arthropoda, since their appearance as a taxonomic group, have been the subject of frequent, sometimes even strange, variations concerning both rank and contents, greatly differing from the concept of the author. Mostly considered as a phylum, it also appears in some works as a "subphylum" of the large phylum Articulata, and thereby originating in Annelida. Considered as an entity, Arthropoda (as accepted by average main treatises) include the subphyla Trilobitomorpha, Chelicerata and Mandibulata (viz. Crustacea, Myriopoda and Insecta, mostly treated as classes) with an uncertain status for Pantopoda. Not uncommon are modern textbooks, which under a designation such as subphylum Proarthropoda we still find the Onychophora, Tardigrada and Linguatulida together, or the last two as "annexed" or "incertae sedis". In modern works, fortunately, the last 3 ones fit their correct places, as independent phyla, before Arthropoda.

During the last 20 years, many studies have converged to demonstrate that Arthropoda, considered as such, are taxonomically and phylogenetically heterogeneous and founded on general ancestral characters acquired at remote times such as the Proterozoicum (since chitinous fossil rests could be attested). The constituent parts of this giant group actually do not represent branches of a common trunk, but well delimited, isolated groups, the exact origins of which remain unknown despite the various advanced suppositions (all of them lacking a material testimony in geological times). During the same time, a successive detachment, based on structural complex and onthological characteristics as well as on the phylogenetic diversity beginning in remote geological periods such as the earlier Cambrium was step by step achieved for Trilobitomorpha, Chelicerata, partially for Pantopoda and Crustacea as well, with simultaneous recognition as distinct phyla. "Myriopoda" and Insecta (s.l.), considered as distinct groups, remained to fill (with class rank) the "phylum" Arthropoda.

According to recent investigations of Manton (1972, 1973) and Anderson

(1973), at least three phyla should now be distinguished having independently reached a grade of advancement: Onelicercta, Crustacea and Uniramia (comprising Onychophora, Myriapoda and Insecta). In spite of their evident distinctness, to collect previously cited groups into a phylum, as Manton (l.c.) did, ignoring the distinctive evolutive lines of each of them, adds to a "Myriopod" mosaic yet another puzzle. The grouping of Insecta (s.l.) and the Onychophora, as a supplement would be nowadays meaningless. The dissociation of the earlier "class" Myriopoda, by recognizing class rank for each of their groups (Symphyla, Pauropoda, Diplopoda and Chilopoda), was already operated chiefly by Verhoeff (1902).

In "Insecta" phylogenetic divergence was also recognized, the Collembola, Protura, Diplura already being conceived as separate classes, opposed to Thysanura (ectognatha) + Pterygota.

Each higher taxon of Arthropoda, hitherto still considered as a class, is actually in all respects (structural, physiological, onthological, phylogenical, and biological) a world "per se". The mutual relations of these worlds, as well as their appearance and original ancestors, are difficult to explain and are subject to questions, in spite of the numerous hypotheses worked out during more than two centuries.

New advances in anatomy, morphology, and taxonomy by distinguished modern-day arachnologists, carcinologists, as well as entomologists excited my highest interest and stimulated me to define the real situation of the Insects among the rest of Arthropoda and to re-evaluate the status of their present categories as well.

Taking into consideration the hitherto achieved results which demonstrate structural, onthological and phylogenetical distinctness, separating each group from the others by large gaps, begun in remote geological periods with independent evolution and general biological patterns, to recognize TRILOBITOMORPHA, CHELICERATA, PANTOPODA, CRUSTACEA, SYMPHYLA, PAUROPODA, DIPLOPODA, CHILOPODA, COLLEMBOLA, PROTURA, DIPLURA, THYSANURA, INSECTA (PTERYGOTA) as independent phyla.

The newly considered phyla actually represent evident and well-separated worlds, the new ancient origins of which are still hypothetical.

The different subordinate categories used in the various special domains of Invertebrates, like helminthology, malacology, carcinology, entomology are more or less particular.

In Malacology, one finds such groups considered by specialists as suborders (below the order), while others call the same groups phalanges by arranging them in the former categories, other scientists calling the same categories subfamilies, analogically subordinated.

In Acarology, the suborders are usually divided in supercohortes, comprising cohortes (hierarchically subdivided in subcohortes) superphallanges, phalanges and subphalanges (composed of superfamilies or families).

In Carcinology, the suborders are divided (from higher to lower taxonomic scale): infraorder, section, cohors (eventually tribe), superfamily, and family.

In Entomology, cohors, phalanx and allied categories are not generally used. Instead, the category tribe, with its divisions, super-, sub-, infra-, is often used to some extent in almost every important group. The rank of tribe is here below that of family. The use of such particular terminology, differing from a "class" to another of a presumed common phylum does not contribute at all to maintain its unitary taxonomic aspect, nor an adequate terminology. A zoologist interested in getting to know a new group actually enters new territory governed by his/her own rules and concepts, as well as by systematic scales, notably diverging from those already known in a former one; it is like a different language one needs to learn.

When starting to work and understand the particular taxonomy of each separate phylum always represents a task for the zoologist. On the whole, taxonomic terms are intricating and arranged in a complex, labyrinthic way, that only few of the advised taxonomists are able to follow. This causes difficulty for the young zoologist, simply baffling him at the very beginning of his career.

Every working entomologist encounters certain difficulties in comprehension of the taxonomic subdivision in his/her special field, even if limited to a small family. He/she is worried because, finding the right way through the labyrinth of the lower tribal categories including super-, sub- and infra- often supplemented with species groups, sections and subsections, each of them varying considerably from one author to another. Sometimes these are so skillfully diversely arranged together as to represents an art and only with great effort and large experience is someone able to reach comprehension. Confronted with such difficulties, one might ask: "What does cohors, phalanx, series, tribe and the like (with their upper- and subdivisions) really mean?" Furthermore, "What is the right taxonomic level for each to be assigned to?" And the answer, Pearse's inspired prediction (1949): "Science is truth. Classification must be expected to grow more complex, as knowledge increases and becomes more critical", wholly proved its exactness.

During the last 25 years, my attention was concentrated more and more on the taxonomy of Insects and, to a degree, on the Arthropoda as a whole. A greater number of deep discrepancies - a veritable gap - between taxonomic units used in the classification of Vertebrates, as compared with that of Invertebrates (Arthropoda chiefly), stressed my own systematic sense, inciting me to look for a realistic solution aimed at achieving an equilibrium for the whole system.

The clear cut difference between these units is at once evident to everyone aiming to get a simultaneous systematic picture of the animal world as a whole. While the superior level of the classificatory system, comprising the vertebrates, is very easily overlooked because it is comprehensible as a whole as organized into its subdivisional categories, the lower levels, occupied by the invertebrates, appear utterly striking in their diversity (excluding a comparable, homogeneous image rather producing a puzzle) as a result of the many, mosaic-like phyla. Each phylum, when taken apart, shows a unique pattern in the taxonomic arrangement of its divisionary categories, in spite of the identical terms (viz. from class to family and below to tribe). The meaning and the contents, in some cases even the taxonomic level, are far from being similar.

The notion "world" is adequate and usual when referring to large animal categories, equally whether vertebrates or invertebrates. But how differently are these worlds taxonomically estimated! The bird world knows about 8600 species distributed in as much as 51 orders, while the almost countless world of Insects most probably includes about two million species, among them almost 400,000 species of Coleoptera, c.150,000 Lepidoptera, c.136,000 Diptera, c.109,000 Hymenoptera, c.120,000 Heteroptera and Homoptera, and c.50,000 Orthoptera (to mention the most numerous groups only), is simply pressed together into a single class. Each of the former groups considered as an order, and hence passively maintained as such because, over the centuries a series of prominent foregoing entomologists - honoured be their memory - settled on such a taxonomic system. To solve now, at least, this unreasonable and deeply misleading situation should be our actual goal.

Let us consider the bird and the mammalian world. Such bird taxa as Accipitriformes, Strigiformes, Anseriformes, Piciformes, as well as Struthioniformes, Rheiformes, Apterygiformes or Tinamiformes, -- these latter comprising but 1-2 species and mammal tax as Rodentia, Artiodactyla, Carnivora,

Pinnipedia, Cetacea, as well as Sirenia, Hyracoidea are all now indisputably accepted as orders. On the other side, enormous groups like Staphylinidae, Scarabaeidae, Cerambycidae, and Curculionidae, as well as other similar groups of Insects, distributed all over the planet and comprising many thousand species each, are still considered as simple families, in spite of crass intrinsic diversities in structure patterns (both in imaginal and larval instars) and their biological peculiarities too, some of them surmounting the number of Vertebrates all together. The divergences inside such large "families" are much larger and much more important than in every Mammalian or Avian order. If the above cited vertebrate orders were moved into the insect world, e.g., among Coleoptera, we might give them a rank of family (at most); meanwhile, a habitually very similar group of vertebrates, now considered as a family, if transferred, to the Insect world, could only obtain a rank of genus (if not, even lower).

Cats and dogs constitute different families among Carnivora; so do ducks and geese inside of Anseriformes, or Varanids and Lacertids in the reptilian order Lacertilia, though all of these couplets are extremely similar. To realize the familiar characteristics does not require any effort; no key is necessary for identifying them as such. Let us turn to the insect world. How could one normally think to put together, -- as some great specialists actually do, -- for example, -Cicindela and Mantichora, with Carabus, Scarites and Brachinus, supplemented with Paussus, to "build" a single family, Carabidae? In comparison with this so called family, lizards and snakes would at most represent a tribe, turtles could with great indulgence be considered a family divided in some subfamilies with a few tribes. Should the familiar category not join all taxa of widest similarity showing an evident "familiar" aspect, without any kind of sophisticated key and to constitute the normal next taxonomic step of a genus?

In Entomology, when compared to vertebrate zoology, we proceed exactly upside-down and it seems as if our goal were to discover the most appropriate way to collect into the same category, namely family, as many taxa as possible, sharing the least common characteristics; for instance, lamellar or filiform antennae. Why should we consider Donacia, Chrysomela, (H)Altica, Hispella and Cassida as representatives of one and the same family? What kind of systematic sense does it make to admit such Insect worlds as scarabaeids, chrysomelids, staphylinids, curculionids, and many others (with many thousand species each) to be considered as families? How and why this striking, wholly meaningless, situation does not shock us or does not incite a general revision? What impedes our acceptance of the same classificatory standard for both major groups, vertebrates and invertebrates? What prohibits such reasonable reorganization: tradition, easiness, fear, lack of courage, or ignorance of the general frame of the animal kingdom?

Should we not use our wisdom and our knowledge to realize and to find a reasonable, equitable manner for judging, naming and applying taxonomic rank over all the animal realm, both living and fossil? Of course we should; it is our permanent task!

Important differences of many kinds occur inside all the present families. They are currently used only to build the number of subordinate taxa below subfamily. When such differences become too disturbing, a daring specialist may appear and introduce some reclassification by "creating" superfamilies, but never by touching the "order" level.

In Arthropoda, the family appears to be considered by many specialists as an almost sacred, eternal, unshockable fortress, never to be touched. Only very seldom and sporadically will a courageous author venture to reclassify by splitting (mostly separating only a small part and raising it up to family if not previously as subfamily). Very often also, this "sacrilege" is criticized or even condemned by colleagues in the systematics. In a few cases, the new solution is thought acceptable and becomes the norm. Such a process began already in the earlier decennia, chiefly in connection with the giant "families" Carabidae, Scarabaeidae, Cerambycidae, and Curculionidae, as well as in smaller ones like Dryopidae. It also continued, but very seldomly as every specialist knows in his own group, in certain families of Insects; it nevertheless failed to be pursued just inside of the larger, complex families, similar to those just cited. The following example may be cited to illustrate the evolution of the family concept. N.F. Meyer (1948) handled the Proctotrupidae as a family, uniting 7 subfamilies; Brues, Melander, Carpenter (1954) were considering them 7 different families; nowadays the specialists recognize some of the same taxa as superfamilies, e.g., Proctotrupoidea, Ceraphronoidea, a.s.o.

The elevation of higher taxa, starting with classes, consequently pushes most of the subordinated taxa upward to the next intermediate categories, very frequently to the next main category, viz.: suborder to order, superfamily to suborder, and so on, as a function of the kind and size of differences and the conception of the dealing specialist.

Proceeding like this some categories below the family, e.g., the tribe-complex, will be simply shut off. Apparently, the number of taxonomic units will increase; it actually remains the same, because those are mostly promoted to the next higher rank only.

The true families mostly originated in unknown, sometimes extinct branches. The apparently meaningless number of currently suggested categories above families should therefore not astonish nor worry systematists, because the argument (the objective nature of species) is offered by nature itself, imposing consequently the structure of the family as well. Attention should also be called on isolated overlived species or groups, frequently artificially introduced in some families despite categoric differences. Disappointment is generated only, owing to the incomensurable form abundance which evolved all along more than 300 million years. Are there too many classes and orders? Let us think of those taxa which, despite their small species contents, are ascribed a high rank (class or even phylum), e.g., Mesozoa (c.50 sp.), Priapulida (9 sp.), Phoronida (18 sp.), Kinorhincha (c.100 sp.), Onychophora (90 sp.), Pentastomida (c.80 sp.), Pogonophora (c.115 sp.) and Chaetognatha (c.80 sp.).

Is the persistence of the present taxonomic status of the Insect world justified? How long should zoological taxonomy remain out of date? Why do we create more categories and subcategories, instead of rebuilding the entire system, a new hierarchical system of the animal realm, in order to furnish naturalists of future generations with a new, more appropriate and strong classification which uses only the same natural units? The right time has arrived to strive for a solution, by granting to every actual taxon its justified definitive place in the system. A new reestimation of the characteristics in each taxonomic category, no matter how temporary, will not be easy, but the responsibility still remains, and it is an imperative task for professional zoologists. To accomplish a reclassification including the fine details and objection-free resolutions of basic taxonomical ground problems (as applied to almost endless forms of Arthropods) is simply impossible for the single specialist. Therefore, only a preliminary attempt can be advanced, to set the stones at the foundation of a new system chiefly by using the new

orientation.

Special attention will now be directed to my own specialized field, the Coleoptera.

Historically, to establish the various taxonomic categories in Coleoptera, chiefly above the present families, we considered all kinds of morphological characteristics, like shape and structure of aedeagus, wing structure (Crampton, Kempers a.o.), metendosternite structure (Crowson), structure of the abdomen (Jeannel A. Paulian), or onthological (larval) patterns (Boving & Craighead, Dolin a.m.o.). We granted only minor importance, or even ignoring, other characteristics, like general shape, antennal or legs structure. Therefore creation of gigantic "families" should not be the least bit surprising considering the enormous number and diversity of existing species.

Therefore we have, on one hand, such uniform, well-shaped groups like Adephaga, Caraboidea, Dytiscoidea, Elateroidea, Cerambycoidea, and many others, while on the other hand we have such "rumplerooms" as Clavicornia, Cucujoidea, and particularly Heteromera serving as hiding places for many unresolved taxonomic problems. Such cases are causing an inevitable breakdown of the system, of which only isolated parts remain useful. That such new taxonomic construction could appear heterogeneous again should not be surprising.

Actually, only the archaic Archostemmata and the Adephaga are to be regarded as subclasses; all the rest, viz. the immense majority currently designated as Polyphaga, still remaining a heterogeneous subclass.

Prof. Dr. R. Jeannel collaborated with Prof. R. Paulian to erect a classification system for Coleoptera, included in P.P. Grasse (1949) -- "Traite de Zoologie" vol. IX. When the Carabidae (s.l.) were treated by Jeannel (1939), the new system was considered very strange and raised a storm of protest which still exists to this day. Categorical opposition is shown by O.L. Kryzhanovskii (1976), in an attempt at revising the group by being enlarged it and incorporation the Cicindelidae, and Paussidae.

The subdivision Adephaga is the almost usual case, its study having been only more enriched and better delimited by means of deeper structural analysis of the aedeagus. In his later publication, "L'edeage" (1955), Jeannel added more precision to his previous established groups, always basing his classification on the structure of the same organ.

The new created "suborders" Haplogastra and Heterogastra (Jeannel & Paulian, 1949) are unlikely to be accepted because of the occurrence of various intermediate forms, and so are the "Myxophaga" (Crowson, l.c.).

In reference to the giant group Polyphaga, Jeannel (l.c.) also offered a notable contribution through his studies on aedeagal structure. However, the numerous exceptions and doubtful cases do not yet permit a satisfactory, clear-cut delimitation of his division. The included diagnoses, on the other hand, can not be considered as such, containing some remarkable confusion and dubious cases too and are not able to support the new erected groups taxonomically, e.g., the contradictions of the mentioned characters in the "Section" Catopiaria, Brachelytra, and Cucujaria. It must be pointed out, by the way, that many of the old-fashioned divisions of earlier authors were well worked out, and have been confirmed by new investigations on aedeagol structure and larval patterns.

TAXONOMICAL SYSTEM OF ARTHROPODA

ARTHROPODA consists of the following independent phyla: TRILOBITOMORPHA, CHELICERATA, PANTOPODA, CRUSTACEA, CHILOPODA, PAUROPODA, DIPLOPODA, SYMPHYLA, PROTURA, COLLEMBOLA, DIPLURA, THYSANURA, and PTERYGOTA (INSECTA).

I. Phylum TRILOBITOMORPHA (+)

A large group of marine invertebrates, appearing in the Proterozoic and extinct before the end of the Permian. "Probably even in the Pre-Cambrian Tetracephalosomita gave rise to two main branches of arthropoda - trilobites and crustaceans" (Sharov 1970). Some authors consider it as original stock of all Arthropoda.

II. Phylum CHELICERATA

"The Chelicerata are among the oldest known groups of animals. They are represented even in the lower Cambrian..." (O. Kraus 1976). Classification based mainly on Kastner (1969) and P. Lehtinen (1967); for Acarians particularly on Van der Hammen (1972-1977), G.W. Krantz (1970), and D.A. Lee (1983), with partially modified taxonomic categories.

Class Merostomata
Subclass Xiphosura
Subclass Eurypterida (+)
Class Scorpiones
Class Palpigradi
Class Ricinulei
Class Solpugidae (Solfugae)
Class Pseudoscorpiones
Order Heterosphyroniformes
Order Diplosphyroniformes
Suborder Neobisiomorphi
Suborder Garypomorphi
Order Monosphyroniformes
Class Opiliones
Order Cyphopthalmi
Order Laniatores
Order Palpatores
Suborder Nemastomatomorphi
Suborder Phalangiomorphi
Class Schizomida
Class Uropygi
Class Amblypygi
Class Araneae
Subclass Liphistiomorpha
Subclass Theraphosomorpha
(=Mygalomorpha)
Subclass Araneomorpha
Order Filistatiformes
Suborder Hypochilomorphi
Suborder Gradungulomorphi
Suborder Filistatomorphi
Suborder (Sicariomorphi)
Suborder (Diguestimorphi)
Suborder (Segestriomorphi)
Order Thaidiformes
Suborder Thaidomorphi
Suborder Megadictyonomorphi
Order Oecobiiformes
Suborder Oecobiomorphi
Order Amaurobioformes
Suborder Gnaphosomorphi
Suborder Lycosomorphi
Suborder Amaurobiomorphi
Suborder Sparassomorphi
Suborder Pisauromorphi
Order Zodariiformes
Suborder Eresomorphi
Suborder Zodariomorphi
Suborder Salticomorphi
Suborder Thomiscomorphi
Order Araneiformes
Suborder Uloboromorphi
Suborder Araneomorphi
Class Anactinotrichida
Superorder Opilioacarida
Superorder Holothyrida
Order Antennophoriformes
Order Liroaspiformes
Order Uropodiformes
Order Zerconiformes
Order Parasitiformes
Order Dermanyssiformes
Superorder Ixodides
Order Ixodiformes
Order Argasiformes
Class Actinotrichida
Superorder Actinedida
Order Alyciformes
Order Bdellformes
Suborder Eupodomorphi
Suborder Tydeomorphi
Suborder Cunaxiomorphi
Suborder Halacaromorphi
Order Labidostommiformes
Order Anystiformes
Suborder Caeculomorphi
Suborder Anystomorphi
Subord. Raphidognathomorphi
Suborder Tetranychomorphi
Suborder Cheyletomorphi
Order Phytoptiformes
Order Trombidiiformes
Suborder Trombidiomorphi
Suborder Hydrachnomorphi
Superorder Oribatida
Order Dimalida
Suborder Palaeosomatina
Suborder Retrofissurina
Suborder Afissurina
Order Comalidia
Suborder Profissurina
Suborder Mixosomatina
Suborder Holosomatina
Superorder Acaridida
Order Acaridiformes
Order Psoroptiformes
Superorder Tarsonema

III. Phylum PANTOPODA

"Pycnogons were away from the main line of arthropod evolution, representing a blind branch. They originate from the annelids" (Sharov 1970).

Class Pycnogonida
Order Colossendeiformes
Order Nymphoniformes
Order Ascorhynchiformes
Order Pycnogoniformes

IV. Phylum CRUSTACEA

Classification after Bowman & Abele (1982), the mosdt recent and authorotative work now available to the family level. In this paper it is slightly modified and used only to the order level.

Class Cephalocarida
Order Brachypoda
Class Branchiopoda
Subclass Calmanostraca
Order Notostraca
Subclass Diplostraca
Order Conchostraca
Order Cladocera
Subclass Sarsostraca
Order Anostraca
Class Pemipedia
Class Maxillopoda
Subclass Mystacocarida
Order Mystacocarida
Subclass Cirripedia
Order Ascothoracica
Order Thoracica
Order Acrothoracica
Order Rhizocephala
Subclass Copepoda
Order Calanida
Order Harpacticida
Order Cyclopida
Order Poecilostomatidae
Order Siphonostomida
Order Monstrillida
Order Misophiida
Order Mormonillida
Subclass Branchiura
Order Argulida
Class Ostracoda
Subclass Myodocopa
Order Myodocopida
Order Halocyprida
Subclass Podocopa
Order Platycopida
Order Podocopida
Subclass Palaeocopa
Order Palaeocopida
Class Malacostraca
Subclass Phyllocarida
Order Leptostraca
Subclass Hoplocarida
Order Stomatopoda
Division Eumalacostraca
Subclass Syncarida
Order Bathynellacea
Order Anaspidacea
Subclass Pancarida
Order Thermosbaenacea
Subclass Percarida
Superorder Spelaeogryphacea
Superorder Mysidacea
Superorder Amphipoda
Superorder Isopoda
Superorder Tanaidacea
Superorder Cumacea
Subclass Eucarida
Superorder Euphasiacea
Superorder Amphionidacea
Superorder Decapoda
Order Macrura
Order Brachyura
Order Anomura

V. Phylum CHILOPODA

Classification based on Verhoeff (1934) and Schubart (1963).

Class Chilopoda
Subclass Anamorpha
Order Scutigeromorpha
Order Craterostigmophora
Order Lithobiomorpha
Suborder Lithobiidea
Suborder Germatobiidea
Subclass Epimorpha
Order Scolopendromorpha
Suborder Cryptopsidea
Suborder Theatopsidea
Suborder Scolopendridea
Order Geophilomorpha

VI. Phylum PAUROPODA

Class Pauropoda
Order Pauropoda
Suborder Pauropodidea
Suborder Brachypauropodidea
Suborder Eurypauropodidea

VII. Phylum DIPLOPODA

Class Pselaphognatha
Order Polyxenida
Class Chilognatha
Subclass Opisthandria
Order Glomerida
Order Sphaerotherida
Order Glomeridesmida
Subclass Proterandria
Order Polydemida
Order Craspedosomida
Order Stemmiulida
Order Callipoda
Order Striariida
Order Platydesmida
Order Polyzonida
Order Siphoniluida
Order Iulida
Order Spirobolida
Order Spirostrepsida
Order Cambalida

VIII. Phylum SYMPHYLA

Class and order Symphyla

Division HEXAPODA

Manton (1972, 1973), following detailed studies of the structural basis of mandibular mechanisms (1964) and locomotion (1972) postulates that the Diplura, Collembola, Protura, Thysanura (s. lat.), and Pterygota all have evolved independently from an ancestor different from that of the Myriapoda (from Kristensen 1975).

IX. Phylum PROTURA

Class and Order Protura
- Suborder Acerentomorphi
- Suborder Eosentomorphi

X. Phylum COLLEMBOLA

Class Collembola
- Order Arthropleona
  - Suborder Poduromorphi
  - Suborder Entomobryomorphi
- Order Symphypleona

XI. Phylum DIPLURA

Class Diplura
- Order Campodeiformes
- Order Japygiformes

XII. Phylum THYSANURA

Class Archaeognatha (Machilidea)
Class Zygentoma (Lepismatidea)

XIII. Phylum PTERYGOTA (INSECTA, s. str.)

A. Section Palaeoptera

Class Ephemeroptera
- Superorder Ephemeromorpha
  - Order Ephemeriformes
  - Order Baetiformes
  - Order Siphlonuriformes

Class Odonatoptera
- Superorder Ononatomorpha
  - Order Zygopterifromes
    - Suborder Hemiphlebiomorphi
    - Suborder Calopterrygomorphi
    - Suborder Lestinomorphi
    - Suborder Coengrionomorphi
  - Order Anisozygopteriformes
    - Suborder Epiophlebiomorphi
  - Order Anisopterifromes
    - Suborder Aeschnomorphi
    - Suborder Libellulomorphi

B. Section Neoptera

Subsection Polyneoptera

Class Plecoptera
- Order Holognatha (=Filipalpia)
- Order Systellognatha (=Setipalpia)
- Order Archiperlaria

Class Notoptera
- Order Grylloblattiformes

Class Dermaptera
- Superorder Forficulomorpha
  - Order Protodermaptera
    - Suborder Pygidiomorphi
    - Suborder Labiduromorphi
  - Order Paradermaptera
    - Suborder Apachyomorphi
  - Order Eudermaptera
    - Suborder Labiomorphi
    - Suborder Forficulomorphi
- Superorder Arexinomorphi
- Superorder Diploglossa

Class Blattoptera
- Superorder Blattomorpha
  - Order Polyphagiformes
  - Order Blaberifromes
  - Order Epilampriformes
  - Order Blatrtiformes
- Superorder Mantomorpha
- Superorder Isoptera (=Termitomorpha)

Class Orthoptera
- Superorder Phasmomorpha
  - Order Phasmiformes
  - Order Bacteriformes
  - Order Pseudophasmiformes
  - Order Timemiformes
- Superorder Ensifera
  - Order Gryllacrididiformes
  - Order Schizodactyliformes
  - Order Grylliformes
  - Order Prophangopsiformes
  - Order Tettigoniiformes
- Superorder Caelifera
  - Order Acridiformes
  - Order Tetrigiformes
  - Order Tridactyliformes

Class Embioptera
- Superorder Embiomorpha

Subsection Paraneoptera

Class Zoraptera
- Order Zorapteriformes

Class Psocoptera
- Subclass Psocomorpha (Copeognatha)
  - Order Trogiformes
  - Order Troctiformes
  - Order Psociformes
- Subclass Phthiraptera
- Superorder Mallophaga
  - Order Amblycera
  - Order Ischnocera
- Superorder Anoplura (Siphonculata)
  - Order Pediculiformes
  - Order Rhynchophthiriformes

Class Thysanoptera
- Superorder Terebrantia
  - Order Aeolothripiformes
  - Order Thripiformes
  - Order Merothripiformes
- Superorder Tubulifera
  - Order Phloeothripiformes
  - Order Urothripiformes

Superclass Hemiptera

Class Homoptera
Subclass Auchenorrynchа
Order Fulgoriformes
Order Cicadiformes
Suborder Ciciadimorphi
Suborder Cercopomorphi
Suborder Jassomorphi
Suborder Membracomorphi
Suborder Cicadellomorphi
Subclass Sternorrhyncha
Superorder Psyllomorpha
Order Psylliformes
Order Aleurodiformes
Superorder Aphidomorpha
Order Aphidiformes
Suborder Adelgomorphi
Suborder Aphidomorphi
Order Cocciformes
Suborder Margarodomorphi
Suborder Lecanomorphi
Suborder Diaspidomorphi
Subclass Coleorrynchа
Class Heteroptera
Subclass Gymnocerata (Geocorisae)
Superorder Telmatomorpha
Superorder Gerromorpha
Superorder Reduviomorpha
Superorder Henicocephalomorpha
Superorder Dipsocoromorpha
Superorder Cimicomorpha
Superorder Lygaeomorpha
Superorder Coreomorpha
Superorder Pentatomomorpha
Superorder Aradomorpha
Superorder Tingitomorpha
Superorder Polyctenomorpha
Superorder Helotrephomorpha
Subclass Cryptocerata (Hydrocorisae)
Superorder Corixomorpha
Superorder Notonectomorpha
Superorder Pleomorpha
Superorder Nepomorpha

Subsection Oligoneoptera

Class Coleoptera
Subclass Archostemata
Superorder Cupedimorpha
Order Cupediformes
Family Cupedidae
Family Mycromalthidae
Family Ommatidae
Family Tetraphaleridae
Subclass Adephaga
Superorder Rhysodimorpha
Order Rhysodiformes
Family Rhysodidae
Superorder Cicindelimorpha
Order Cicindeliformes
Suborder Ctenostomorphi
Family Ctenostomidae
Suborder Collyromorphi
Family Collyridae
Suborder Megacephalomorphi
Family Platychilidae
Family Onimidae
Family Megacephalidae
Suborder Cicindelomorphi
Family Dromicidae
Family Prothymidae
Family Terastidae
Family Odontochilidae
Family Cicindelidae
Order Mantichoriformes
Family Mantichoridae
Superorder Carabomorpha
Order Omophroniformes
Family Omophronidae
Order Carabiformes
Suborder Trachypachymorphi
Family Trachypachidae
Family Gehringidae
Suborder Metriimorphi
Family Metriidae
Suborder Carabomorphi
Family Carabidae (s. str.)
Family Cychridae
Family Pamboridae
Suborder Nebriomorphi
Family Nebriidae
Family Notiophilidae
Family Opisthiidae
Suborder Elaphromorphi
Family Elaphridae
Suborder Migadopomorphi
Family Migadopidae
Suborder Loricеromorphi
Family Loriceridae
Suborder Siagonomophi
Family Siagonidae
Family Enceladidae
Family Cymbionotidae
Suborder Scaritidomorphi
Family Scaritidae
Family Clivinidae
Family Salcenidae
Family Promecognathidae
Suborder Hiletomorphi
Family Hiletidae
Suborder Broscomorphi
Family Broscidae
Family Apotomidae
Suborder Psydromorphi
Family Psydridae
Suborder Trechomorphi
Family Trechidae
Family Merizodidae
Family Zolidae
Family Bembidiidae
Family Aniliidae
Family Tachyidae
Family Limnastidae
Family Pogonidae
Suborder Patrobomorphi
Family Patrobidae
Family Deltomeridae
Suborder Perigonomorphi
Family Perigonidae
Family Lachnophoridae
Family Anchonoderidae
Suborder Omphreomorphi
Family Omphreonidae
Suborder Harpalomorphi
Family Ditomidae
Family Anisodactylidae
Family Daptidae
Family Acinopidae
Family Tricotichnidae
Family Harpalidae
Family Stenolophidae
Family Bradycellidae
Family Acupalpidae
Family Amblystomidae
Suborder Cnemacanthomorphi
Family Cnemacanthidae
Suborder Agonicimorphi
Family Agonicidae

Suborder Pterostichomorphi
Family Pterostichidae
Family Sphodridae
Family Anchomenidae
Family Zabridae
Family Amaridae
Family Agonidae
Family Microcheilidae
Family Chaetodactylidae
Family Molopidae
Family Dercylidae
Family Stomidae
Family Myadidae
Suborder Cuneipectomorphi
Family Cuneipectidae
Suborder Callistomorphi
Family Callistidae
Family Oodidae
Family Licinidae
Family Badistridae
Suborder Panagaeomorphi
Family Panaeidae
Family Brachygnathidae
Suborder Peleciinomorphi
Family Peleciidae
Suborder Pentagonicomorphi
Family Pentagonicidae
Suborder Odacanthomorphi
Family Odacanthidae
Family Ctenodactylidae
Suborder Masoreomorphi
Family Masoreidae
Family Cyclosomidae
Family Graphipteridae
Suborder Lebiomorphi
Family Lebiidae
Family Calleidae
Family Cymindidae
Family Pseudomasoreidae
Family Dromiidae
Family Demetriidae
Family Percalidae
Suborder Orthogoniimorphi
Family Orthogoniidae
Family Callistomorphidae
Suborder Antiomorphi
Family Anthiidae
Suborder Agriomorphi
Family Agridae
Suborder Helluodomorphi
Family Helluodidae
Suborder Helluonomorphi
Family Helluonidae
Suborder Eucheilomorphi
Family Eucheilidae
Suborder Zuphiomorphi
Family Zuphiidae
Suborder Dryptomorphi
Family Dryptidae
Suborder Galeritomorphi
Family Galeritidae
Suborder Brachinomorphi
Family Brachinidae
Family Creptodopteridae
Suborder Mormolycomorphi
Family Mormolycidae
Family Thyreopteridae
Suborder Pseudomorphomorphi
Family Pseudomorphidae

Order Paussiformes
Family Paussidae
Family Protopaussidae
Family Cerapteridae
Family Ozaenidae
Family Cicindidae
Family Nototylidae
Superorder Haliplomorpha
Order Haliploformes
Family Haliplidae
Superorder Amphizoomorpha
Order Amphizoiformes
Family Amphizoidae
Superorder Hygrobiomorpha
Order Hygrobiiformes
Family Hygrobiidae
Superorder Dytiscomorpha
Order Dytisciformes
Family Noteridae
Family Laccophilidae
Family Hydrovatidae
Family Hyphydridae
Family Bidessidae
Family Hydroporidae
Family Vatellidae
Family Copelatidae
Family Agabidae
Family Methlidae
Family Eretidae
Family Hydacticidae
Famnily Colymbetidae
Family Thermonectidae
Family Cybistreidae
Family Dytiscidae (s. str.)
Superorder Gyrinomorpha
Order Gyriniformes
Family Enhydridae
Family Gyrinidae (s. str.)
Family Orectochilidae

Subclass Polyphaga
Superorder Hydrophilomorpha
Order Hydrophiliformes
Family Spercheidae
Family Helophoridae
Family Hydrochidae
Family Hydrobiidae
Family Chaetarthriidae
Family Hydrophilidae (s. str.)
Family Epimetopidae
Family Berosidae
Family Amphiopidae
Superorder Histeromorpha
Order Histeriformes
Suborder Saprinomorphi
Family Chlamydopsidae
Family Saprinidae
Family Abraeidae
Family Tripanaeidae
Family Trypecticidae
Family Teretriidae
Family Plegaderidae
Family Onthophilidae
Suborder Histeromorphi
Family Exosternidae
Family Dendrophilidae
Family Tribalidae
Family Platysomidae
Family Hololeptidae
Family Hetaeriidae
Order Niponiiformes
Order Synteliiformes
Order Ectrephiformes

Superorder Staphylinomorpha
Order Hydraeniformes
Family Hydraenidae
Family Ochthebiidae
Order Limnebiiformes
Family Limnebiidae
Order Ptiliiiformes
Family Ptiliidae
Family Limuloidae
Family Cephalopectidae
Family Sphaeriidae
Family Hydroscaphidae
Family Torrincolidae
Order Dasyceriformes
Family Dasyceridae
Order Catopiformes
Family Leptinidae
Family Bathysciidae
Family Catopidae
Family Colonidae
Family Liodidae
Family Anisotomidae
Family Camiaridae
Family Scotocryptidae
Family Calyptomeridae
Family Eustadiidae
Family Empelidae
Family Catopoceridae
Family Clambidae
Family Platypsyllidae
Order Silphiformes
Family Necrophoridae
Family Silphidae
Order Agrytiformes
Family Agrytidae
Order Scymaeniformes
Family Leptoscymaenidae
Family Chevrolatiidae
Family Euthiidae
Family Cephenniidae
Family Stenichidae
Family Scydmaenidae (s. str.)
Family Clidicidae
Familt Mastigidae
Family Leptomastacidae
Family Brathinidae
Order Scaphidiiformes
Family Scaphiidae
Family Scaphosomidae
Order Staphyliniformes
Family Osoridae
Family Pseudopsidae
Family Phloeocharidae
Family Olisthaeridae
Family Metopsiidae
Family Proteinidae
Family Omaliidae
Family Megarthridae
Family Deleasteridae
Family Coprophilidae
Family Syntomiidae
Family Oxytelidae
Family Leptotyphlidae
Family Oxyporidae
Family Stenidae
Family Euaesthetidae
Family Paederidae
Family Lathrobiidae
Family Cryptobiidae
Family Xantholinidae
Family Othiidae
Family Staphylinidae (s. str.)
Family Philonthidae
Family Quediidae
Family Atanygnathidae
Family Habroceridae
Family Trichophyidae
Family Bolitobiidae
Family Conosomidae
Family Tachyporidae
Family Tachinidae
Family Hypocyptidae
Family Deinopsidae
Family Gymnusidae
Family Myllaenidae
Family Diglottidae
Family Pronomaeidae
Family Oligotidae
Family Hygronomidae
Family Gyrophaenidae
Family Homalotidae
Family Silusidae
Family Bolitocharidae
Family Autaliidae
Family Falagriidae
Family Athetidae
Family Calliceridae
Family Schistogeniidae
Family Zyrasidae
Family Hoplandriidae
Family Caloderidae
Family Dinardidae
Family Oxypodidae
Family Aleocharidae
Order Pselaphiformes
Family Faronidae
Family Dimeridae
Family Pyxidiceridae
Family Jubidae
Family Euplectidae
Family Trichonychidae
Family Bastricidae
Family Bythinidae
Family Tychidae
Family Brachyglutidae
Family Goniaceridae
Family Cyathigeridae
Family Reichenbachiidae
Family Holozoidae
Family Arhytodidae
Family Hybocephalidae
Family Schistodactylidae
Family Ctenistidae
Family Tyridae
Family Olavigeridae
Family Gnostidae
Superorder Aculagnathomorpha
Order Aculagnathiformes
Family Aculagnathidae
Superorder Scarabaeomorpha
Order Lucaniformes
Family Lucanidae
Family Lamprinidae
Family Chiasognathidae
Family Odontolabidae
Family Cladognathidae
Family Dorcidae
Family Figulidae
Family Syndesidae
Family Aesalidae
Family Ceruchidae
Family Nicagidae
Family Ceratognathidae
Family Sinodendridae

Order Passaliformes
Family Passalidae
Order Trogiformes
Family Trogidae
Order Scarabaeiformes
Family Onitidae
Family Oniticellidae
Family Onthaphagidae
Family Copridae
Family Scarabaeidae (s. str.)
Family Acanthoceridae
Family Bolboceridae
Family Geotrupidae
Family Lethridae
Family Aphodiidae
Family Aegialiidae
Family Chironidae
Family Dynamopidae
Family Hybosoridae
Family Idiostomidae
Family Ochodaeidae
Family Orphniidae
Family Glaphyridae
Family Taurocerastidae
Order Melolonthiformes
Family Systellopidae
Family Chasmatopteridae
Family Sericidae
Family Sericoididae
Family Melolonthidae (s. str.)
Family Macrophyllidae
Family Macrodactylidae
Family Pachypodidae
Family Pleochomidae
Family Aclopidae
Family Hopliidae
Family Euchiridae
Family Dynastidae
Family Rutelidae
Family Anomalidae
Family Spodochlamyidae
Family Anoplognathidae
Family Adoretidae
Family Goniatidae
Family Phaenomeridae
Family Desmonycidae
Family Cetoniidae
Family Goliathidae
Family Schizorrhinidae
Family Gymnetidae
Family Cremastochilidae
Family Valgidae
Family Trichiidae
Family Osmodermidae
Family Cryptodontidae
Superorder Eucinetomorpha
Order Eucinetiformes
Family Clambidae
Family Calyptomeridae
Family Eucinetidae
Family Helodidae
Family Cyphonidae
Family Eubriidae
Superorder Dascillomorpha
Order Dascilliformes
Family Dascillidae
Family Rhipiceridae
Family Karumiidae
Superorder Byrrhomorpha
Order Byrrhiformes
Family Byrrhidae
Family Pedilophoridae
Family Amphicyrtidae
Family Chelonariidae

Superorder Heteroceromorpha
Order Heteroceriformes
Family Heteroceridae
Superorder Dryopomorpha
Order Dryopiformes
Family Psephenidae
Family Ptilodactylidae
Family Eulichatidae
Family Eurypogonidae
Family Chelonariidae
Family Limnichidae
Family Dryopidae
Family Elminthidae
Order Georyssiformes
Family Georyssidae
Superorder Artematopomorpha
Order Artematopiformes
Family Artematopidae
Family Callirhipidae
Family Brachypsectridae
Superorder Buprestomorpha
Order Buprestiformes
Family Acmaeoderidae
Family Ptosdomidae
Family Melanophilidae
Family Polycestidae
Family Schizopidae
Family Throncopygidae
Family Chrysochroidae
Family Chalcophoridae
Family Sphenopteridae
Family Buprestidae (s. str.)
Family Chrysobothridae
Family Stigmoderidae
Family Anthaxiidae
Family Agrilidae
Family Coraebidae
Family Cylindromorphidae
Family Aphanisticidae
Family Trachydidae
Superorder Elateromorpha
Order Elateriformes
Family Eucnemidae
Family Melasidae
Family Dirrhagidae
Family Gastralaucidae
Family Subprotelateridae
Family Thylacosternidae
Family Octocryptidae
Family Agriotidae
Family Agrypnidae
Family Monocrepididae
Family Chalcolepididae
Family Oxynopteridae
Family Elateridae (s. str.)
Family Pleonomidae
Family Sericosomidae
Family Physorrhinidae
Family Pomachiliidae
Family Hypnoididae
Family Cardiophoridae
Family Negastriidae
Family Melanotidae
Family Gonoderidae
Family Athoidae
Family Cteniceridae
Family Dimidae
Family Ampedidae
Family Tetralobidae
Family Dicrepididae
Family Eudactylidae
Family Pityobiidae
Family Pyrophoridae
Family Ludiidae

Family Oestididae
Family Crepidomenidae
Family Hemicrepidiidae
Family Allotriidae
Family Hypodesiidae
Family Cardiorhinidae
Family Adrastidae
Family Drapetidae
Family Denticollidae
Family Physodactylidae
Family Cebrionidae
Family Plastoceridae
Family Dicronychidae
Family Trixagidae
Family Balgidae
Family Cerophytidae
Family Perothopidae
Family Cavicoxumidae

Superorder Cantharomorpha
Order Canthariformes
Family Cneoglossidae
Family Telegeusidae
Family Homalisidae
Family Lycidae
Family Lampyridae
Family Luciolidae
Family Drilidae
Family Phengodidae
Family Silidae
Family Ototretidae
Family Omethidae
Family Lucidotidae
Family Lamproceridae
Family Dadophoridae
Family Photinidae
Family Photuridae
Family Megalophthalmidae
Family Amydetidae
Family Rhagophthalmidae
Family Cantharidae (s. str.)
Family Malthinidae

Superorder Dermestomorpha
Order Dermestiformes
Family Derodontidae
Family Nosodendridae
Family Orphilidae
Family Dermestidae
Family Trinodidae
Family Attagenidae
Family Anthrenidae
Family Megatomidae
Family Marioutidae
Family Thylodridae
Family Sarothriidae

Superorder Thorictomorpha
Order Thorictiformes
Family Thorictidae

Superorder Anobiomorpha
Order Anobiiformes
Family Hedobiidae
Family Dryophilidae
Family Ernobiidae
Family Anobiidae (s. str.)
Family Ptilinidae
Family Xyletinidae
Family Cercosmidae
Family Dorcatomidae
Family Mesocoelopidae
Family Ectrephidae
Family Ptinidae
Family Gibbiidae

Superorder Bostrychomorpha
Order Bostrychiformes
Family Bostrychidae
Family Lyctidae
Family Psoidae

Superorder Cleromorpha
Order Cleriformes
Family Cleridae
Family Tillidae
Family Korynectidae
Family Hydnoceridae
Family Phyllobaenidae
Family Enopliidae
Order Trogositiformes
Family Trogositidae
Family Nemosomidae
Family Lophocateridae

Superorder Melyromorpha
Order Melyriformes
Family Dasytidae
Family Malachiidae
Family Melyridae
Family Phloeophilidae
Family Peltidae
Family Prionoceridae
Family Rhadalidae
Family Phycosecidae
Family Acanthocnemidae

Superorder Lymexylonomorpha
Order Lymexyloniformes
Family Hylecoetidae
Family Lymexylonidae

Superorder Cucujomorpha
Order Cucujiformes
Family Nitidulidae
Family Cateretidae
Family Cybocephalidae
Family Cryptorchidae
Family Carpophilidae
Family Smicripidae
Family Rhizophagidae
Family Lenacidae
Family Thionidae
Family Monotomidae
Family Sphindidae
Family Aspidiphoridae
Family Passandridae
Family Boganiidae
Family Cucujidae
Family Phloeostichidae
Family Hyliotidae
Family Laemophloeidae
Family Prostomidae
Family Ancistriidae
Family Silvanidae
Family Psammoecidae
Family Helotidae
Family Propalticidae
Family Cryptamorphidae
Family Hemipeplidae
Family Promechilidae
Family Micropeplidae
Family Piestidae
Family Hypocopridae
Family Cryptophagidae
Family Telmatophilidae
Family Atomariidae
Family Byphillidae
Family Byturidae
Family Languriidae
Family Setariollidae

Family Pharaxonothidae
Family Cladoxenidae
Family Erotylidae
Family Encaustidae
Family Triplacidae
Family Dacnidae
Family Xenoscelidae
Family Catopochrotidae
Family Phalacridae
Family Cerylonidae
Family Corylophidae
Family Discolomidae
Family Merophysidae
Family Holoparamecidae
Family Anommaidae
Family Corticariidae
Family Lathridiidae
Family Bothrideridae
Family Murmidiidae
Family Mychoceridae
Family Lapethidae

Superorder Coccinellomorpha
Order Coccinelliformes
Family Epilachnidae
Family Lithophilidae
Family Coccinellidae
Family Sphaerosomidae
Family Mycaeidae
Family Trochoideidae
Family Endomychidae
Family Eumorphidae
Family Amphicidae
Family Dapsidae
Family Epipocidae
Family Stenotarsidae
Family Synonychidae
Family Chilocoridae
Family Hyperaspidae
Family Scymnidae
Family Coelopteridae
Family Coccidulidae

Superorder Mycetophagomorpha
Order Mycetophagiformes
Family Mycetophagidae
Family Esarcidae
Family Monoedidae

Superorder Colydiomorpha
Order Colydiiformes
Family Colydiidae
Family Aglenidae
Family Synchitidae
Family Orthoceridae
Family Corticidae
Family Apristidae
Family Coxelidae
Family Tarphiidae
Family Pycnomeridae
Family Myrmecoxenidae
Family Deretaphridae
Family Nematidiidae
Family Gempylodidae
Family Acropidae
Family Cisidae
Family Hendecatomidae

Superorder Lyttomorpha
Order Lyttiformes
Family Lyttidae
Family Cerocomidae
Family Meloidae
Family Mylabridae
Family Zonitidae
Family Nemognathidae

Superorder Tenebriomorpha
Order Tenebrioniformes
Family Tentyriidae
Family Stenosidae
Family Asididae
Family Pimeliidae
Family Blaptidae
Family Platyscelidae
Family Pedinidae
Family Cnemeplatiidae
Family Opatridae
Family Trachyscelidae
Family Phalerridae
Family Crypticidae
Family Bolitophagidae
Family Cnemodinidae
Family Erodidae
Family Eurymetopidae
Family Thinobatidae
Family Auchmobiidae
Family Trimytidae
Family Trientomidae
Family Evaniosomidae
Family Epitrgaidae
Family Lachnogyidae
Family Klewariidae
Family Zophosidae
Family Triorophidae
Family Edrotidae
Family Epiphysidae
Family Adesmiidae
Family Craniotidae
Family Leptodidae
Family Zopheridae
Family Usechidae
Family Adelostomidae
Family Araeoschizidae
Family Stenosidae
Family Platamodidae
Family Dacoderidae
Family Typhlusechidae
Family Batulidae
Family Cryptochilidae
Family Calognathidae
Family Anepsiidae
Family Varonidae
Family Nyctoporidae
Family Cryproglossidae
Family Elenophoridae
Family Coniontidae
Family Nycteliidae
Family Praocidae
Family Branchidae
Family Coelidae
Family Moluridae
Family Sepidiidae
Family Akididae
Family Falsomycteridae
Family Apolitidae
Family Scauridae
Family Scotobiidae
Family Platyopidae
Family Remipedellidae
Family Eleodidae
Family Physogasteridae
Family Rhipidandridae
Family Ulodidae
Family Diaperidae
Family Leiochrinidae
Family Phrenapatidae
Family Ulomidae
Family Helaeidae
Family Cossyphidae
Family Eutelidae

Family Tenebrionidae (s. str.)
Family Goniaderidae
Family Helopidae
Family Apocryphidae
Family Adeliidae
Family Hypophloeidae
Family Talanidae
Family Helopinidae
Family Meracanthidae
Family Pterogeniidae
Family Rhysopaussidae
Family Strongylidae
Family Heterotarsidae
Family Pycnoceridae
Family Cyphaleidae
Family Cnodalomidae
Family Alleculidae
Family Omophilidae
Family Lagriidae
Family Statiridae
Family Trachelostenidae
Family Agnathidae
Family Monommidae
Family Orchesiidae
Family Eustrophilidae
Family Melandryidae
Family Dircaeidae
Family Synchroidae
Family Mallodryidae
Family Hypulidae
Family Penthidae
Family Conopalpidae
Family Osphyidae
Family Stenotrachelidae
Family Hallomenidae
Family Boridae
Family Perimylopidae
Family Elacatidae
Family Othniidae
Family Inopeplidae
Family Salpingidae
Family Mycteridae
Family Conotidae
Family Trictenotomidae
Family Pythidae
Family Pyrochroidae
Family Synchroidae
Family Anthicidae
Family Eurystethidae
Family Pedilidae
Family Pedilidae
Family Aderidae
Family Notoxidae
Family Petriidae
Family Tetrothoracidae

Superorder Mordellomorpha
Order Mordelliformes
Family Anaspididae
Family Rhipiphoridae
Family Pelecotomidae
Family Evaniocerídae
Family Rhipidiidae

Superorder Oedomeromorpha
Order Oedomeriformes
Family Scraptiidae
Family Calopodidae
Family Oedemeridae

Superorder Cerambycomorpha
Order Disteniiformes
Family Oxypeltidae
Family Philidae
Family Vesperidae
Family Disteniidae

Order Parandriformes
Family Parandridae
Family Erichsoniidae

Order Prioniformes
Family Macrotomidae
Family Basitoxidae
Family Mallodontidae
Family Cnemoplitidae
Family Aulacopidae
Family Remphanidae
Family Callipogonidae
Family Aegosomidae
Family Orthomegidae
Family Ctenoscelidae
Family Hoplideridae
Family Prionidae
Family Acanthophoridae
Family Prionommidae
Family Cyrtognathidae
Family Meroscelidae
Family Delochelidae
Family Tragosomidae
Family Tereticidae
Family Monodesmidae
Family Anoplodermidae

Order Hypocephaliformes
Family Hypocephalidae

Order Cerambiciformes
Family Thaumasidae
Family Erlandiidae
Family Smodicidae
Family Protaxidae
Family Spondylidae
Family Asemidae
Family Saphanidae
Family Oemidae
Family Methiidae
Family Achrysonidae
Family Torneutidae
Family Metopocoilidae
Family Cerambycidae (s. str.)
Family Hesperophanidae
Family Eburidae
Family Elaphidionoididae
Family Sphaerionidae
Family Piezoceridae
Family Ibidionidae
Family Eligmoderidae
Family Callidiopsidae
Family Curiidae
Family Graciliidae
Family Dodecosidae
Family Obriidae
Family Neosteníidae
Family Aphanasiidae
Family Phlyctenodidae
Family Tessaromidae
Family Strongyluridae
Family Uracanthidae
Family Psilomorphidae
Family Holopteridae
Family Rhagiomorphidae
Family Tropocalymmidae
Family Styllidae
Family Euchapteridae
Family Mythodidae
Family Ametrocephalidae
Family Aphneopidae
Family Lepturidae
Family Encyclopidae
Family Dorcasomidae
Family Dejaniridae
Family Bimmidae
Family Stenopteridae
Family Psebiidae

Family Thraniidae
Family Molorchidae
Family Necydalopsidae
Family Phalotidae
Family Trichomesiidae
Family Rhinotragidae
Family Hesthesidae
Family Distichoceridae
Family Eroschemidae
Family Pyresthidae
Family Prothemidae
Family Pytheidae
Family Prothemidae
Family Pytheidae
Family Deilidae
Family Typhlocasidae
Family Callichromidae
Family Compsoceridae
Family Callidiidae
Family Oedenoderidae
Family Clytidae
Family Chilonidae
Family Michthysomidae
Family Tillomorphidae
Family Sestyridae
Family Cleomenidae
Family Rhopalophoridae
Family Glaucytidae
Family Heteropsidae
Family Agallissidae
Family Ancyloceridae
Family Coelarthridae
Family Atimiidae
Family Poecilopeplidae
Family Tropidosomidae
Family Sternacanthidae
Family Pteroplatidae
Family Stenaspidae
Family Dorcaceridae
Family Trachyderidae
Family Lissonotidae
Family Megaderidae
Family Tragoceridae
Family Sphinteriidae
Family Sphingonotidae
Family Navomorphidae

Order Lamiiformes
Family Dorcadionidae
Family Moriopsidae
Family Phrissomidae
Family Lamiidae (s. str.)
Family Monochamidae
Family Potemnemidae
Family Agniidae
Family Batoceridae
Family Gnomidae
Family Mesosidae
Family Atossidae
Family Metonidae
Family Ancitidae
Family Ancylonotidae
Family Prosopoceridae
Family Sternotomidae
Family Tragocephalidae
Family Cliniidae
Family Ceroplesidae
Family Crossotidae
Family Phrynetidae
Family Pachystolidae
Family Omacanthidae
Family Baraeidae
Family Xyloryzidae

Family Rhodopidae
Family Protonarthridae
Family Acmoceridae
Family Dorcaschemidae
Family Xenoleidae
Family Hyborhabdidae
Family Nemotragidae
Family Anauxesidae
Family Nyctimenidae
Family Amymomidae
Family Protorhopalidae
Family Homoneidae
Family Tmesisternidae
Family Crinotarsidae
Family Arsysiidae
Family Bumetopidae
Family Enicodidae
Family Tapeinidae
Family Epispastidae
Family Theocriidae
Family Zygoceridae
Family Ecyroschemidae
Family Hebecesidae
Family Hecyridae
Family Niphonidae
Family Corynofreidae
Family Apomecynidae
Family Cloniocerídae
Family Adetidae
Family Pteropliidae
Family Ataxiidae
Family Pterocoptidae
Family Desmiphridae
Family Apodasyidae
Family Nedinidae
Family Estolidae
Family Pogonocheridae
Family Megabasidae
Family Compsosomidae
Family Aereneidae
Family Phacellidae
Family Oncideridae
Family Onocephalidae
Family Hippopsidae
Family Aprosopidae
Family Ecatosiidae
Family Ischiolonchidae
Family Emphytoeciidae
Family Anisoceridae
Family Platysternidae
Family Polyrhaphidae
Family Acrocinidae
Family Acanthoderidae
Family Astynomidae
Family Cyrtinidae
Family Colobotheidae
Family Agapanthiidae
Family Saperdidae
Family Phytoecillidae
Family Tetraopesidae
Family Amphiomycidae
Family Aerenicidae
Family Gryllicidae
Family Calliidae
Family Hebestolidae
Family Auxesidae

Order Megalopodifromes
Family Megalopodidae
Family Zeugophoridae

Order Bruciformes
Family Bruchidae
Family Rhaebidae

Order Chrysomeliformes
Suborder Crioceromorphi
Superfamily Sagroidea
Family Sagridae
Family Megameridae
Family Carpophagidae
Family Mecynoderidae
Family Ametallidae
Family Aulacoscelidae
Superfamily Donacoidea
Family Donaciidae
Superfamily Orsodacnoidea
Family Orsodacnidae
Superfamily Crioceroidea
Family Criocerídae
Superfamily Megasceloidea
Family Megascelidae
Suborder Clythromorphi
Superfamily Clythroidea
Family Clythridae
Family Megalostomidae
Family Babiidae
Family Ischiopatidae
Superfamily Cryptocephaloides
Family Stylosomidae
Family Pachybrachytidae
Family Achaenopitidae
Family Monachidae
Family Cryptocephalidae
Superfamily Chlamydoidea
Family Chlamydidae
Suborder Chrysomelomorphi
Superfamily Lamprosomoidea
Family Lamprosomidae
Family Sphaerocharidae
Superfamily Eumolopoidea
Family Chrysodinidae
Family Colaspidae
Family Chalcophanidae
Family Stenomelidae
Family Spilopyridae
Family Nodostomidae
Family Pagriidae
Family Callisinidae
Family Tomyridae
Family Odontionopidae
Family Scelodontidae
Family Leprotidae
Family Heteraspidae
Family Cheirideidae
Family Metachromidae
Family Eumolpidae
Family Euryopidae
Family Eubrachidae
Family Pseudocolaspidae
Family Adoxidae
Family Edusidae
Family Myochroidae
Family Merodidae
Family Typophoridae
Family Corynodidae
Family Endocephalidae
Superfamily Chrysomeloidea
Family Zygogrammidae
Family Chrysomelidae (s. str.)
Family Colaspidemidae
Family Sternomelidae
Family Paropsidae
Family Clidonotidae
Family Licariidae
Family Timarchidae
Superfamily Galerucoidea
Family Adoriidae
Family Aulucophoridae
Family Phyllobroticidae
Family Driabroticidae
Family Agelasticidae
Family Procalidae
Family Ornithognathidae
Family Agetoceridae
Family Mimastridae
Family Cerophysidae
Family Apophyliidae
Family Scelididae
Family Luperidae
Family Atysidae
Family Schematizidae
Family Coelomeridae
Family Metcyclidae
Family Rupiliidae
Family Galerucidae
Family Sermylidae
Family Cerotomidae
Family Antiphidae
Family Monoleptidae
Family Hylaspidae
Family Theopeidae
Family Platyxanthidae
Family Goniopleuridae
Superfamily (H)Alticoidea
Family Blepharidídae
Family Elithiidae
Family Diamphidiidae
Family Acrocryptidae
Family Monoplastidae
Family Pseudolampsidae
Family Oedionychidae
Family Aspicelidae
Family (H)Alticidae (s. str.)
Family Mniophilidae
Family Lacticidae
Family Crepidoderidae
Family Luperalticidae
Family Arisopodidae
Family Eupelectoscelidae
Family Oxygonidae
Family Plectroscelidae
Family Systenidae
Family Aphthonidae
Family Diboliidae
Family Psylliodidae
Family Nonarthridae
Suborder Cassidomorphi
Superfamily Hispoidea
Family Amplipalpidae
Family Cephaloleidae
Family Hybosispidae
Family Arescidae
Family Alurnidae
Family Prosopodontidae
Family Cephalondontidae
Family Hispoleptidae
Family Octotomidae
Family Bothryonopidae
Family Anisoderidae
Family Aproididae
Family Callispidae
Family Leptohispidae
Family Eurispidae
Family Cryptonychidae
Family Choerdionidae
Family Oncocephalidae
Family Exothgispidae
Family Coelaenomenoderidae
Family Promecothecidae
Family Erionispidae
Family Wallaceiade
Family Hispidae (s. str.)

Superfamily Cassidoidea
Family Hoplinotidae
Family Tauromidae
Family Cassididae (s. str.)
Superorder Curculionomorpha
Order Nemonychiformes
Family Nemonychidae
Order Anthribiformes
Suborder Urodontomorphi
Family Urodontidae
Suborder Anthribomorphi
Superfamily Tropideroidea
Family Phloetragidae
Family Mecoceridae
Family Tophoceridae
Family Discotenidae
Family Ischnoceridae
Family Sintoridae
Family Acorynidae
Family Phloeophilidae
Family Tropideridae
Family Zygenodidae
Family Prosoporhinidae
Family Corrheceridae
Family Apolectidae
Family Becatophanidae
Family Xenoceridae
Family Xylinadidae
Family Eceloneridae
Superfamily Anthiboidea
Family Basitropidae
Family Eugonidae
Family Anthribidae (s. str.)
Family Brachytarsidae
Superfamily Araeoceroidea
Family Araeoceridae (s. str.)
Family Notioxenidae
Family Choragidae
Superfamily Xenorchestoidea
Family Xenorchestidae
Order Beliformes
Family Belidae
Order Oxychoriformes
Family Oxychoridae
Order Aglycyderiformes
Family Aglycyderidae
Order Allocoryniformes
Family Allocorynidae
Order Attelabiformes
Suborder Attelabomorphi
Family Attelabidae (s. str.)
Family Euopidae
Suborder Apoderomorphi
Family Hoplapoderidae
Family Apoderidae (s. str.)
Family Trachelophoridae
Order Rhynchitiformes
Family Auletidae
Family Rhynchitidae (s. str.)
Family Byctiscidae
Family Deporaidae
Order Apioniformes
Family Apionidae
Order Brenthiformes
Superfamily Brenthoidea
Family Taphoderidae
Family Cyphagogidae
Family Ischnomeridae
Family Epheboceridae
Family Trachelizidae
Family Arrhenodidae
Family Belopheridae
Family Belorhynchidae
Family Brenthidae (s. str.)
Family Euthrachelidae
Family Ceocephalidae
Family Nematocephalidae
Family Ithystenidae
Family Eremoxenidae
Superfamily Uloceroidea
Family Uloceridae
Order Curculioniformes
Suborder Ithyceromorphi
Family Ithyceridae
Suborder Bracyceromorphi
Superfamily Brachyceroidea
Superfamily Microceroidea
Superfamily Protomantoidea
Suborder Cryptodermomorphi
Family Cryptodermidae
Suborder Tachygonomorphi
Family Tachygonidae
Suborder Otiorrhynchomorphi
Superfamily Eremnoidea
Superfamily Ophryastoidea
Family Leptopsidae
Family Strangalionidae
Family Ophryastidae
Family Leptostethidae
Family Hypsonothidae
Family Entimidae
Superfamily Tropiphoroidea
Superfamily Dirotognathoidea
Superfamily Promecopodoidea
Superfamily Tanymecoidea
Family Piazomiidae
Family Tanymecidae
Superfamily Pandeletoidea
Superfamily Aleceidoidea
Superfamily Cyphoidea
Superfamily Polydrusoidea
Superfamily Bosyroidea
Superfamily Sciaphiloidea
Superfamily Thylacitoidea
Superfamily Epiceroidea
Superfamily Barynotoidea
Superfamily Cneorrhinoidea
Superfamily Calyptilloidea
Superfamily Celeuthetoidea
Superfamily Otiorrhynchoidea
Family Ptochidae
Family Otiorrhynchidae
Family Mylacorrhynchidae
Superfamily Trachyphloeoidea
Superfamily Simoidea
Superfamily Eustyloidea
Superfamily Phyllobioidea
Superfamily Mesostyloidea
Superfamily Cyclopteroidea
Superfamily Holocorhinoidea
Superfamily Nastoidea
Superfamily Metacenopoidea
Superfamily Oosomoidea
Superfamily Episomoidea
Superfamily Laparoceroidea
Superfamily Rhadinosomoidea
Superfamily Geonomoidea
Superfamily Pripusoidea
Superfamily Pachyrhynchoidea
Suborder Curculionomorphi
Superfamily Sitonoidea
Superfamily Alophoidea
Superfamily Hyperoidea
Superfamily Emphyatoidea
Superfamily Pissoidea

Superfamily Curculionoidea
Family Lepyridae
Family Plinthidae
Family Anchonidae
Family Cholidae
Family Sternechidae
Family Hylobiidae
Superfamily Hipporhinoidea
Superfamily Rhypareosomoidea
Superfamily Camarotoidea
Superfamily Menemachoidea
Superfamily Erirrhinoidea
Family Erirrhinidae
Family Bagoidae
Family Hydronemidae
Family Cryptoplidae
Family Eugnomidae
Family Storeidae
Family Derelomidae
Family Tanysphyridae
Family Smicronychidae
Superfamily Tanyrrhynchoidea
Superfamily Tychoidea
Superfamily Otidocephaloidea
Superfamily Hoplorrhinoidea
Superfamily Magdalidoidea
Superfamily Balaninoidea
Superfamily Coryssomeroidea
Superfamily Auchmerestoidea
Superfamily Anthonomoidea
Superfamily Anoploidea
Superfamily Prionomeroidea
Superfamily Cionoidea
Superfamily Lignyodoidea
Superfamily Mecinoidea
Superfamily Cleonoidea
Superfamily Ceratopoidea
Superfamily Sternechoidea
Superfamily Laemosaccoidea
Superfamily Alcidoidea
Superfamily Metatygoidea
Superfamily Baridoidea
Family Baridiidae
Family Dyorimeridae
Family Eurhinidae
Family Centinidae
Family Leptoschoinidae
Family Nertidae
Family Apostasimeridae
Family Madopteridae
Family Nadaridae
Family Lyteriidae
Family Barymeridae
Superfamily Orobitoidea
Superfamily Ambatoidea
Superfamily Peridinetoidea
Superfamily Pantateloidea
Superfamily Optatoidea
Superfamily Zygopoidea
Superfamily Trypetoidea
Superfamily Ceuthorrhynchoides
Family Ceuthorrhynchidae
Family Mononychidae
Family Scleropteridae
Family Phytobiidae
Family Hypuridae
Family Rhinoncidae
Superfamily Cryptorrhynchoidea
Family Cryptorrhynidae
Family Ithyporidae
Family Cleognathidae
Family Psepholacidae
Family Strongylopteridae
Family Netarrhinidae
Family Guiopteridae
Family Ocladiidae
Family Sophrorhinidae
Family Camptorhinidae
Family Tylodidae
Family Mecistostylidae
Family Sympiezoscelidae
Family Hybomorphidae
Family Trichodoceridae
Family Acamptidae
Family Arthrostemidae
Superfamily Torneumatoidea
Suborder Thecostomomorphi
Family Brysopidae
Family Gronopidae
Suborder Cossonomorphi
Family Cossonidae
Family Acamptidae
Family Anchonidae
Family Dryophthoridae
Family Lymnatidae
Family Rhyncolidae
Family Hormopidae
Family Raymondionymidae
Suborder Calandromorpha
Family Rhynchophoridae
Family Ommatolpidae
Family Calandridae
Family Sphenocorynidae
Family Sphenophoridae
Family Litosomidae
Family Sipalidae
Family Orthognathidae
Family Sclerocaridae
Family Rhinidae
Suborder Nanophyiomorphi
Family Nanophyidae
Suborder Orchestomorphi
Family Orchestiidae

(Note: the following groups are to be placed at their places in this order: Amycteroidea, Somatodoidea, Haplopidae, Goniopteridae, Diabathrariidae, Aterpidae, Pelorhinidae, Lithinidae, Petalochilidae, Epipedidae, Pyropidae, Isorhynchidae, Lobotrachelidae, Conophoridae, Ulomascidae, Ecteumorhinidae, Mesoptilidae, Scolopteridae, Hyplonycidae, Euderidae, Nerthopidae, Microstylidae, Acallopistidae, Trigonoscelidae, Campyloscelidae, and Stromboceridae.)

Order Proterrhiniformes
Superfamily Proterrhinoidea
Family Proterrhinidae
Superorder Scolytomorpha
Order Scolytiformes
Suborder Scolytomorphi
Superfamily Scolytoidea
Family Scolytidae
Family Xyloctonidae
Family Hylocuridae
Family Araptidae
Family Hexacolidae
Superfamily Phloeotrupoidea
Suborder Hylesinomorphi
Superfamily Hylesinoidea
Family Hylesinidae
Family Phloeotribidae
Family Crypturgidae

Suborder Ipidomorphi
Superfamily Ipidoidea
Family Ipidae
Family Cryphalidae
Family Corythylidae
Family Xyloboridae
Family Pityphthoridae
Suborder Micracidomorphi
Family Micracidae
Suborder Scolytoplatypodomorphi
Family Scolytoplatypodidae
Order Platypodiformes
Superfamily Platypodoidea
Family Platypodidae
Order Chapuisiiformes
Superfamily Chapuisioidea
Family Chapuisiidae
Subclass Strepsiptera
Superorder Mengeomorpha
Family Mengeidae
Superorder Stylopomorpha
Family Stylopidae
Family Elenchidae
Family Halictophagidae
Class Hymenoptera
Subclass Chalastogastra (Symphyta)
Order Megalodontiformes
Order Siriciformes
Order Tenthrediniformes
Order Cephiformes
Subclass Clistogastra
Superorder Terebrantia
Order Ichneumoniformes
Order Braconiformes
Order Cynipiformes
Order Chalcidiformes
Order Serphiformes
Order Peliciniformes
Superorder Aculeata
Order Bethyliformes
Order Chrysidiformes
Order Formiciformes
Order Scoliiformes
Order Vespiformes
Order Spheciformes
Order Apiformes
Class Neuroptera
Superorder Megaloptera
Superorder Raphidioptera
Superorder Neuroptera (s. str.)
(=Planipennia)
Order Ithoniformes
Order Coniopterygiformes
Order Osmyliformes
Order Mantispiformes
Order Hemerobiiformes
Order Myrmeleontiformes
Superclass Mecopteroidea
Class Mecoptera
Order Protomecoptera
Order Eumecoptera
Order Neomecoptera
Class Trichoptera
Order Inaequipalpia
Order Aequipalpia
Class Lepidoptera
Superorder Homoneura
(=Monotrysia, Jugatae)
Order Micropterygiformes
Order Eriocraniiformes
Order Hepialiformes
Superorder Heteroneura
(=Ditrysia, Frenatae)
Order Cossiformes
Order Castniiformes
Order Zygaeniformes
Order Incurvariiformes
Order Nepticuliformes
Order Pyralidiformes
Order Sphingiformes
Order Tineiformes
Order Pterophoriformes
Order Tortriciformes
Order Hyponomeutiformes
Order Gelechiiformes
Order Elaschistiformes
Order Callidduliformes
Order Bombyciformes
Order Saturniiformes
Order Noctuiiformes
Order Drepaniformes
Order Geometriformes
Order Uraniiformes
Order Hesperiformes
Order Papilioniformes
Class Diptera
Subclass Nematocera
Order Tipuliformes (=Polyneura)
Suborder Trichoceromorphi
Suborder Tipulomorphi
Order Psychodiformes
Suborder Blepharoceromorphi
Suborder Nymphomyomorphi
Suborder Ptychopteromorphi
Suborder Psychodomorphi
Order Culiciformes
Suborder Culicomorphi
Suborder Chironomomorphi
Order Bibioniformes
Suborder Pachyneuromorpha
Suborder Anisopodomorpha
Suborder Bibionomorpha
Suborder Mycetophilomorphi
Infraorder Scatopsidea
Infraorder Cecidomyidea
Infraorder Mycetophilidea
Subclass Brachycera
Order Homeoedactyla
(=Tabaniformes)
Infraorder Xylophagidea
Infraorder Stratiomyidea
Infraorder Tabanidea
Infraorder Nemestrinidea
Order Asiliformes
Suborder Asilomorphi
Suborder Empidiomorphi
Order Cyclorrhapha
Suborder Anatriata
(=Acroptera)
Suborder Aschiza
Infraorder Phoridea
Infraorder Syrphidea
Suborder Schizophora
Section Acalyptratae
Infraorder Conopidea
Infraorder Micropezidea
Infraorder Nothibidea
Infraorder Otitidea
Infraorder Sciomyzidea
Infraorder Lauxaniidea
Infraorder Pallopteridea
Infraorder Anthomzidea
Infraorder Agromyzidea
Infraorder Chloropidea
Infraorder Drosophildea
Section Calyptrata
Infraorder Mormotomyidea
Infraorder Glossiniidea
Infraorder Muscidea
Infraorder Calliphoridea
Class Siphonaptera (Aphaniptera)
Order Siphonaptera

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Neues hierarchisches System der Arthropoda, mit besonderer Berrucksichtigung der Insekten.

Zusammenfassung

I. Die letzten modernen Forscungen haben gezeigt dass der bisher als Kreis betrachtete Arthropoda in der Tat heterogenetisch und polyphyletisch, aus vollig getrennten Tiergruppen kunstlich zusammengestellt worden ist. Verfasser halt die bis jetzt als untergeordnete Klassen desselben betrachteten Gruppen als eigene Stamme, ohne nahere phyletische Beziehungen, u.zw.: TRILOBITOMORPHA, CHELICERATA, PANTOPODA, CRUSTACEA, CHILOPODA, DIPLOPODA, PAUROPODA, SYMPHYTA, PROTURA, COLLEMBOLA, DIPLURA, THYSANURA, PTERYGOTA (INSECTA, s. str.). Es gibt keine beweisbare Zeichen dass diese Gruppen sei dem Proterozoicum irgendwelche gegenseitige phyletische Verwandtschaft besitzen. Die Promotion dieser Gruppen zu Stamme, wie uns die Natur selbst lehrt, erhebt gleichzeitig die untergeordneten Kategorien automatisch auf hohere Stufen.

II. Zwischen den fur die Wirbeltiere benutzten taxinomischen Messeinheiten und diejenigen die fur die Wurbellosen, die Arthropoda ins besondere angenommenen besteht eine taxinomische Kluft, die jedem erfahrenen Zoologen sofort in die Augen springt. Naher betrachtet, sind die homonomen Gruppen dieser zwei Abteilungen des Tierreichs recht verschieden; so sehen die Ordnungen der ersteren viel naher zueinander als die Familien der letzteren. Um in der Klassifikation des gesamten Tierreichs ein Gleichgewicht zu schaffen, zwingt uns die Natur selbst die niederen Kategorien der Arthropoden, besonders der Insekten, eine hohere Stufe zuzuschreiben. Auf dieser Weise werden z.B.die Insektenordnungen als Klassen, die Mentzahl der heutigen Familien als Ordnungen gewertet. Zugleich wird das grosse Heer der unterstenKategorian unterhalb der Familian als uberflussig weggenworfen. Der zweite Teil dieser Arbeit stellt das neue System der Arthropoden in Hauptzugen dar, wo die Kafer bis auf Familien bearbeitet werden.

To Jim Dunford

SWALLOWTAIL HUNT

My friend and I went hunting one day,
to catch some swallowtails in a special place.

Where thistles grow with a very sweet taste,
that bring the swallowtails from every state.

We traveled straight through the marsh and fields,
when we finally arrived, our nets we did yield.

We spotted a swallowtail that flew from the south,
and landed on a thistle with out a doubt.

It was big and black with a tint of green,
and had two long tails that were so neat.

We approached with caution as much as we could,
to make sure that swallowtail calm where it stood.

We moved in closer to get a good swing,
but it took off so quick, as if it was tugged by a string.

It flew over the thistles and down the hill,
so we went to chase it, it was such a big thrill.

It landed on a flower and fluttered its wings,
so we approached once more to catch that thing.

We both took a swing so quick and fast,
that we both caught a swallowtail that was split in half.

By Walter B. Schultz
February 1982

WASP WINGS

Wasp wings shine brightly in the sun.

Sometimes I wish I had those glorious wings!

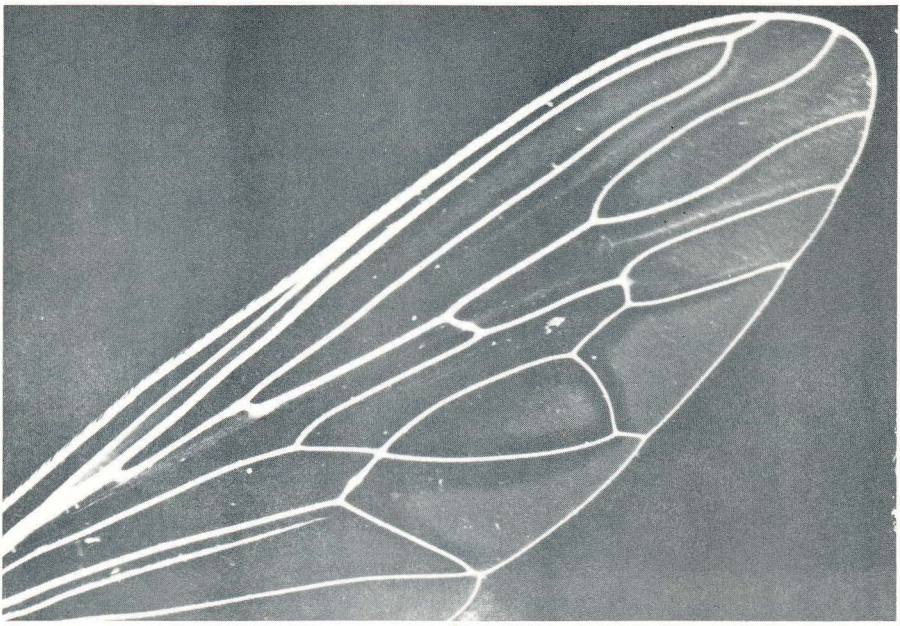
You can see right through them,

If you try.

It's nice to have wasp wings nearby.

Michelle Yokoyama (8 yrs.)
1825 NW Grant
Corvallis, Oregan 97330 USA

Robber fly wing

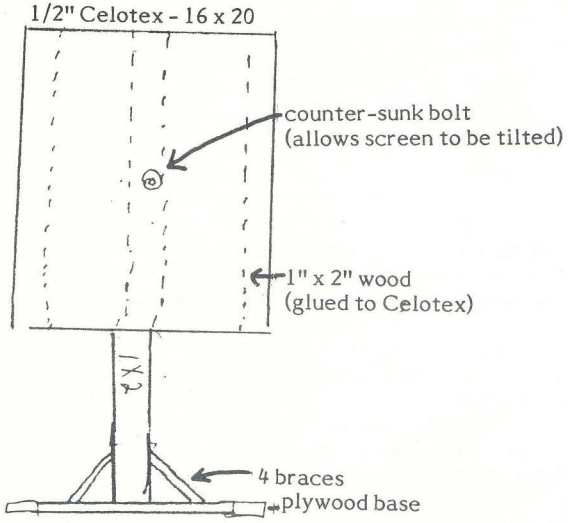


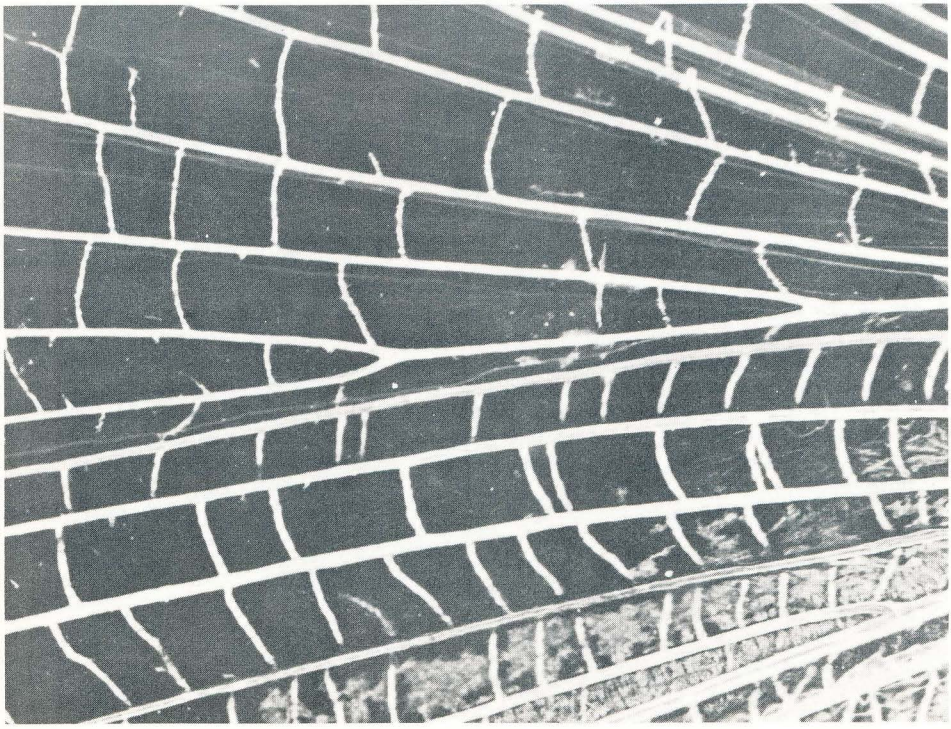
Photograph by Helmuth Schulz, Jr., Petoskey, MI

HOW THE PHOTOGRAPHS WERE MADE. The insect wings are sandwiched between two pieces of 2.75 x 2.75 inch glass and held together with tape around the edges. The slide is used as a negative in an enlarger and to make the small insect wings large enough I project the slide on the floor. Sometimes I turn the enlarger horizontally and project the image on a special moveable screen (fig. 1). The screen is specially designed so I can tilt it at any angle; this way I don't have to fuss with the slide in the enlarger. The paper is held to the celotex screen with thumb tack "guides", string and heavy rubber bands. I am always looking for new insect subjects to photograph, and would be happy to receive specimens from YES members.

Helmuth Schulz, Jr., 1582 US 131 South, Petoskey, MI 49770 USA.

Fig. 1: Screen for horizontal projection.





Detail of praying mantid hindwing
Photograph by Helmuth Schulz, Jr.,
Petoskey, MI

Blacklighting Tips

Gary A. Dunn
Department of Entomology
Michigan State University
East Lansing, MI 48824-1115
USA.

There are many ways to run a productive blacklight setup. There are endless variations on this collection method, and practically everyone has developed a favorite method. I'd like to share two of my favorite methods for blacklighting.

The first method is most useful for blacklighting in open expanses. This is the method I use when blacklighting for tiger beetles and other insects at alkali flats and fields. I use a DC-powered blacklight unit that plugs into an automotive cigarette lighter.

Because the cord is not overly long (this tends to limit where I can set up the light), I have fashioned some simple, inexpensive extension cords. All you need is a length of 18 gauge lamp cord (I made one 50' and the other 100' in length), a cigarette lighter plug ("male") and a cigarette lighter receptacle ("female"). These materials are commonly available at hardware stores and automotive stores. Connect one end of the lamp cord to the cigarette lighter plug. Be sure to properly align the positive and negative wires. The plug's leads should be marked positive (+) and negative (-). The lamp cord has the positive wire grooved or striped in some fashion. Next, attach the cigarette lighter receptacle, again being sure to properly align the positive and negative wires. Generally, the positive wire will attach to the central part of the receptacle's back end, and the negative wire must be attached to the outer cylindrical part of the receptacle. Wrap the areas where you have attached and spliced wires with black electrical tape. Your cord is now ready for use. I use an "H-shaped" wire caddy to keep my cord neat and tangle-free.

With my two extension cords I can set up my blacklight some 150 feet from my 4 x 4 pickup. In open areas I suspend my light beneath a camera tripod and allow the light to shine in all directions.

In these wide-open areas some insects, especially beetles actually walk up to the light. Many others fly to the lighted area and then run about on the ground. To easily catch these insects without having to individually grab each one, I simply place a couple pie pans in the ground and fill them with a small amount of ethylene glycol (automotive antifreeze). While insects are busily falling into the pans you can devote your attention to the outermost reaches of the lighted area. Many insects sit in the shadows or the very periphery of the lighted area, never approaching the light. This is where a flashlight, headlamp or lantern comes in handy to aid in collecting these "shy" insects.

The other blacklighting method I use involves the use of a white sheet and my 4 x 4 pickup (which has a camper cap on the back). I drape the sheet over either the back end or side of my truck, using rocks or sticks to hold it in place. I suspend the blacklight in front of the sheet on a horizontally protruding stick or net handle. It helps to adjust the sheet so that the bottom portion of the sheet rests on the ground in an "L-shaped" configuration. This way, any specimens that drop from the sheet as you're trying to get them in the jar will land on the sheet and can usually be caught.

Because this blacklight setup is one-directional, a certain amount of care must be taken in selecting the direction to shine the light. I find this method works well when I am trying to attract beetles from a specific habitat, such as beach, section of stream bank, marsh or wooded area.

As with all collecting techniques, blacklighting is meant to be experimental with. Try different setups and be prepared to modify your setup in the field to meet varying conditions. Doing so will assure profitable blacklight collecting.

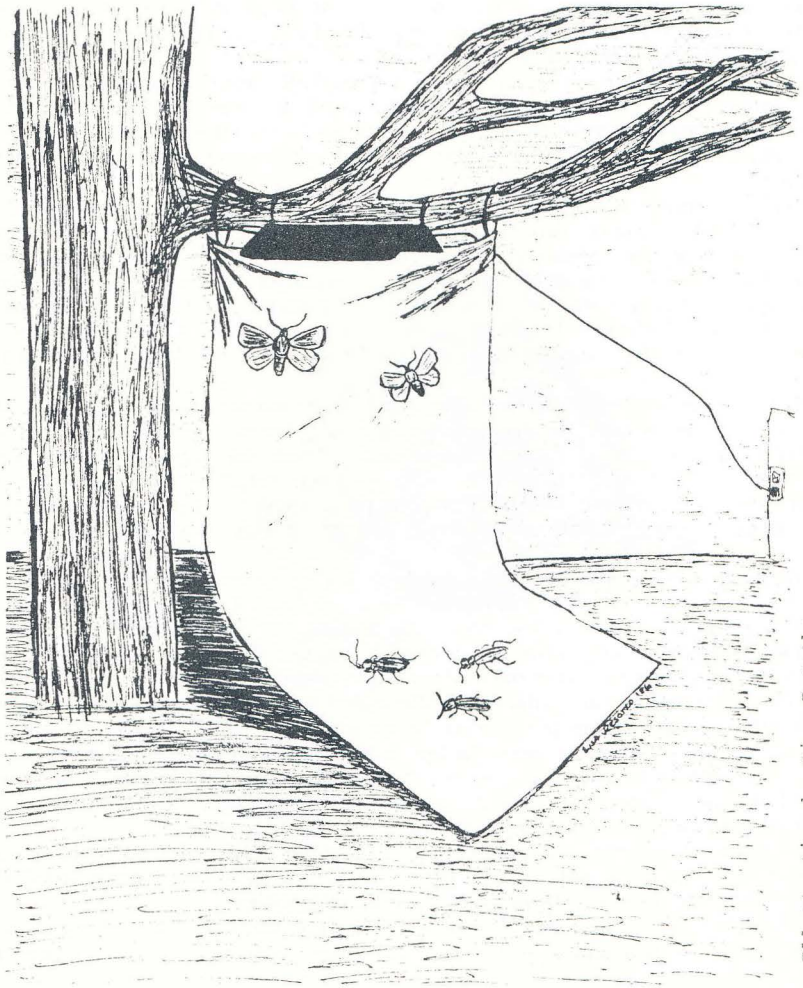


Illustration by Lisa Resotko
Towaco, NJ

THE BUTTERFLY BUSH (Buddleia)

Patricia Purdy
303 Elm Street
Salem, VA 24153 USA

For those who want guaranteed results, the butterfly bush is perhaps the most effective shrub to plant for attracting butterflies. I highly recommend these plants -- if you live in a climate where they can be grown. I have kept butterfly bushes for several years now; and can honestly say they have brought many pleasurable hours in watching the insect activity around them.

Butterfly bushes are late starters -- they do not begin growth until the end of spring, after most other plants have already leafed out. There are several cultivated varieties and colors of butterfly bushes. All are excellent for attracting butterflies. Perhaps the most popular and widely available variety is the butterfly bush Buddleia davidii. It comes in 5 different colors: deep purple, pink, red, blue, and white.

This tall shrub grows fast; about 5 feet tall (with an equal spread) the first summer, and they will also bloom the first summer they are planted. In frost-free climates they may grow much taller. The flower spikes which this shrub bears are 6-8 inches long, and covered with dense, sweet-spicy fragrant blossoms.

Buddleia davidii blooms from midsummer or July until frost; and during this time the shrub attracts host of butterflies and other nectar-seekers. Among its visitors are the Monarch butterflies, eastern tiger swallowtails, zebra swallowtails, great-spangled fritillaries, painted ladies, red admirals, hummingbird moths, skippers, honeybees, bumblebees; and an occasional hummingbird. Perhaps of all its visitors, I would have to say the Monarch butterfly lingers the most around this bush; particularly during its migration time.

If you order butterfly bushes from mail-order nurseries, be cautious. Make sure the firm is reliable before purchasing from them. Be sure that the plant material you are sent is "living" material. Check for signs of green growth near base of plant; and make sure there is green color beneath the surface of the stems. Return your plants promptly for a replacement if these signs are not present. The best time to order and plant new butterfly bushes is in April.

For best enjoyment, butterfly bushes can be planted in a sunny position near the house or not far from your porch patio. You can not observe the insect activity as easily if you plant the bushes too far away in the yard. A location where you will have full view of it from a window is also excellent. But, no matter where you place the bush, it must have full sun.

Butterfly bushes, particularly Buddleia davidii, are not very dense growing and won't serve the same purpose as hedge-type shrubs. However, they can be planted in borders where a dense hedge is not required; or, they can be planted in front of other taller, more dense shrubs. I think they perform best when planted solitarily or in circular groups (all unto their own kind) in the center isles of the lawn or border areas.

The tops of butterfly bushes either die or are badly injured most winters. These shrubs could be set at the back of perennial borders along with other annual plants that normally die down to the ground each year.

Butterfly bushes grow best in zones 5-10 (the southern half of the U.S.) in full sun and well-drained soil that has been enriched only a little with

compost or other black rich soil. Plant in spring to give them a full growing season to establish themselves. Since problems of winter hardiness may be experienced in colder regions, butterfly bushes are NOT recommended for the northern parts of the United States.

Keep newly planted butterfly bushes watered well during the first summer while they are establishing themselves. Thereafter, water them during drought periods.

The flowers of the butterfly bush (Buddleia davidii) form on the current season's growth; prune in early spring before new growth starts so that the current season stems can produce flowers. I do not recommend severe pruning of this shrub. Only trim off a good third of the shrub (enough of the dead stem ends to remove the old flower spikes). Do not cut the shrub down to the ground.

For those who really love butterflies -- a butterfly bush is a must for you. Try one -- you'll love it!

"Spicebush Swallowtail on Thistle"
Lisa Resotko, Towaco, NJ

HOW TO RAISE INSECTS IN CLASS OR AT HOME

Ainat Silberman
910C Eagle Heights
Madison, WI 55705
(Van Hise Middle School)

Raising insects in the classroom or at home is an excellent way to learn about life cycles, food chains, and affects of overpopulation.

The equipment you might want to use are: 35 x 55' fish tank, 2 light bulbs (15 watt), fine screen, gravel, (sandy) soil, thermometer, and aluminum foil.

Take the fish tank and hang two 15 watt light bulbs over it. Cover the top with fine screen so the terrarium is secure enough to handle small animals and can also provide breathing. DO NOT use fish tanks with cracks. If there are, young insects will escape and die.

On the bottom of the tank place a layer of gravel. Build a small hill on the side of the tank with soil and cover the gravel as well.

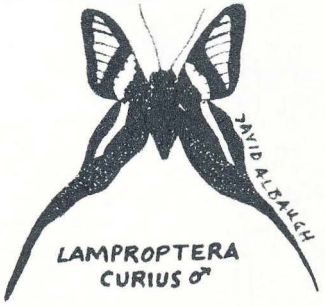
Hang a small thermometer inside your terrarium so you know how hot or cold it should be inside. You might want to keep the temperature around 24° - 27°C. When the evenings grow colder you might want to turn on the light bulbs for extra warmth.

At night cover your terrarium with foil to keep it nice, warm, and moisturized. Take your foil off in the mornings when it's warmer, and see how the insects changed over night. You should sprinkle the soil with water once a week, but only if the terrarium gets very dry.

To complete your terrarium you collect the following males and females: grasshoppers, crickets, fruit flies, salamanders, earthworms, spiders, and even some garter snakes. Observe the tank daily and record any changes.

You should understand that some insects are more difficult to raise than others. The grasshoppers are harder to raise than the fruit flies. Soon after the grasshopper has mated the nymphs should be moved into a small jar. Feed the young juice from slivered celery stalks. Once they get older they will eat celery leaves, lettuce, and apple pulp.

To raise most insects, start in early September and release in the spring.



CRICKETS AS PETS

Carey Trost
209 N. Whitney Way
Madison, WI 53705
(Van Hise Middle School)

While collecting insects to identify for a science project, I found I really enjoyed having some crickets. I decided in order to keep them I had to find out what they would require to stay alive in a container. I checked out several books from the library and found that the best ways of keeping crickets were either in an aquarium or a jar. The jar must be covered with screening and so should the aquarium if it is not taller than 12 inches above the highest points. All containers should be kept out of the sun. The container should have sand, gravel, or soil lining the bottom and rocks and branches for climbing.

Crickets will eat almost anything including glue from bookbindings, wallpaper paste, carpet wool, fruits, vegetables, and even meats. It is possible for them to get their water supply from the fruits, but it is best to actually give them water. There are several ways to do this. The best is to fill a test tube with water, plug it with a piece of cotton or sponge, and lay it on its side on the bottom. Then simply check the food and water daily and replace the old items with fresh ones.

These insects are very easy, inexpensive, and interesting to keep. The crickets' chirping is enjoyable to hear because, in addition to being entertaining, it tells you that your crickets are content.

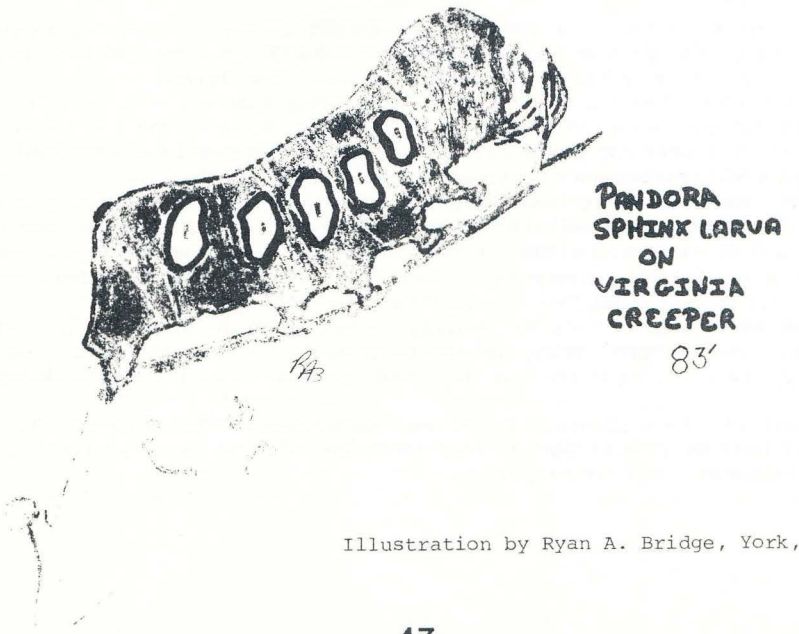


Illustration by Ryan A. Bridge, York, PA

TOO MANY

Kathy Miktuk
RD #1, Box 119
Panama, NY 14767 USA

In June I learned a lesson: there is such a thing as "too many" caterpillars. Now that may seem like an obvious truism, but for fanatics like me "too many" does not exist. Well, I learned!

It all started simple enough. Last fall, I found three reddish-brown, soft, fuzzy caterpillars. The ate weeds from the garden and thus were easy to raise to maturity. This should have been a clue to what lay ahead, but I was not suspicious.

Soon, they formed three oval prickly cocoons which I stored carefully all winter. Spring arrived; time for butterflies and moths to emerge. I was anxious for mine to emerge so I could identify them.

It proved very easy to identify the small white moths as yellow woolybears (Diacrisia virginica), I had two females and one male. I also caught a wild male. I was hoping to be able to raise a few of the caterpillars, because they change colors as they grow. At first, they're almost white. They soon become yellow, then red, brown, or sometimes pitch black. Also, they will eat nearly ANY green thing they find.

The two females must have thought it was their duty to populate an area for they each laid more than 250 eggs. This was fine, I thought, because chances were good that a few would hatch. WRONG! They all hatched.

As yet I still did not foresee any problems because, for most species, there would be a certain mortality rate anyway. And, too, these caterpillars were only two millimeters long. However, they did not know the meaning of the word "mortality".

So, I kept them in a jar and fed them dandelion leaves. They begin eating and growing. The jar soon became crowded. Even though I changed them every day, conditions were such as would kill other species. These thrived.

I now encountered a problem with their living quarters -- it was far too crowded for the larvae to grow. So I invented a better home for them. It consisted of a large cardboard box with nylon net suspended halfway down the sides, parallel to the bottom and a screen on top for a lid.

There were now more than 500 caterpillars, each 40 mm long, living in the caterpillar house. This still did not seem to be a problem. However, one day while I was at work, most of them got loose and were running around my room and the living room. What a surprise for Mom and Dad when they got home! Since they got home before I did, they caught all the little runaways.

Now when it came time for feeding, I would spend as much time gathering food as I did actually caring for the caterpillars. The caterpillars liked to challenge me by trying to see how many could get out before I was done changing them.

Eventually, they all began to change into cocoons. What a relief! Now, I wouldn't have to work so hard to keep them fed. For two weeks, all was calm with my cocoons. Then chaos again.

Upon hatching, they immediately found they could squeeze out of the box whenever my back was turned. They thought it was a good idea to fly about the house at night and land on the curtains in the morning. It was easy to removed the adults from the curtains, so I didn't mind.

Suddenly, the females began to lay eggs. What a mess -- eggs were all over the box. Normally, this wouldn't have been a problem; as a matter-of-fact, I would usually have been overjoyed to get eggs. When they began hatching, I knew I had to do something fast. Knowing their hardiness, I quickly calculated that I would have approximately 62,500 caterpillars.

Since I had no intention of raising that many caterpillars and I knew that many would defoliate a large piece of land if freed, I had no choice but to quickly and painlessly exterminate them. I kept only eight caterpillars.

That is the lesson I learned: there is, certainly, a "too many" limit on these little creatures. To promote and then destroy their tiny lives is wasteful, indeed. Despite the fact that it occurred by accident, I still feel bad about what happened. My last comment is that this species would be a great laboratory animal.

BODY PARTS OF THE ANT

Hillary Campbell
713 Odana Lane
Madison, WI 53711 USA
(Van Hise Middle School)

The HEAD. The ant's head contains a small brain, but it is very intellegent. In fact, an ant is the most intellegent insect in the class Insecta. The ant's jaws are very strong. They are used for tearing food and carrying materials. Ant jaws are very different from ours because they move sideways rather than up and down. Ants also have antennae or feelers. They use their antennae to communicate with each other and to feel their food.

The THORAX. The thorax is were all six legs are connected to the body. There are also wing muscles and wings in reproductive females, males and queens.

The ABDOMEN. The abdomen is the most unusual part of the ant. The ant has two "stomachs". The larger one, called the crop, is used to store food. This food may be fed to other ants, or if the ant needs nourishment itself, the food passes into the other stomach. On some ants' abdomens there are stingers. Some ants, like the fire ant, can inflict painful stings.

EXPERIMENTS WITH A MODEL WATER STRIDER

Jeff Miller
Van Hise Middle School
Madison, Wisconsin

Walking on Water: The Water Strider

For me, the water strider has always been a symbol of freedom and happiness. It is a friend to all who frequent quite ponds and slow moving creeks and rivers. It is always there, literally "walking on water".

The water strider is a member of the order or group of insects called hemiptera, or the true bugs. It is, then, an insect not a spider like its nickname "water spider" suggest it is. Like all insects, it has three body segments: the head, the thorax, and the abdomen. It also has long jointed legs, an exoskeleton, and wings (though on some species, the wings are very small, and therefore useless), all of these things denote insects.

The strider also has a few things that most other insects don't have. namely their special feet that make them capable of their famous acrobatic act, walking on water. Their feet are constructed somewhat like an old toothbrush. Many little water-proof hairs stick out of their feet in every which way. The hairs form many air pockets, and that gives the strider much buoyancy.

Besides making the air pockets possible, the hairs perform another important function. They aren't just water resistant the way a piece of window glass is. The are actually water repellent. This means that the hairs cause the water to roll away without even getting wet. This is very important to the safety of the strider. If, by some small chance, the strider ever got dunked, water would seep into the air pockets of the feet and the strider would be a goner. With the repellent hairs, the water doesn't have a chance to fill the strider air pockets, and he quickly bounces back to the surface.

The repellent hairs play one more important role. They are made of a repellent so strong, that the feet don't even penetrate the surface of the water. They only make slight dimples in the water surface that cast shadows of the six feet on the bottom of the water.

There are a few other things that help these amazing insects stay afloat even in very rough water, even in the ocean! Their long, wide spreading legs give them a steady, evenly distributed center of balance. Their large feet give a larger surface area touching the water, for a more stable "base" to stand on. And, their sheer light weight reduces their chances of going under tremendously.

Man has had an age-old desire to "walk on water", but just remember, the water strider did it first.

My project is a model that demonstrates how this fascinating little creature, the water strider, stays afloat. The water strider is an aquatic insect that is found on most still ponds, on some lakes, and on slow moving rivers; some species are even found in the ocean, sometimes over 350 km from any land. This model is a study of the floating devices of these insects.

I began out my research by making frequent trips down to a quiet lake and watching the striders; the way they eat and move. Then, working from pictures and a live specimen, I started construction on the model.

The model uses everyday materials and is constructed following the same ideas as the water strider. The wax paper "feet", filled with air, follow the rules of the water striders' feet having water-resistant hairs that are arranged so they trap air bubbles.

	Model Standards	Insect Standards
Weight	2.5 grams	.8 grams
Weight able to carry*	8.6 grams	6.4 grams
Surface area touching water	24 centimeter^2	.7 centimeter^2

*On the model, this was determined by fixing a small paper box on its back and dropping in weights until it sank. Then the weights were reduced, and so on until the largest weight that the insect could carry was learned. I used the same test for the insect, but instead of glue I used a drop of wax to attach the box to the strider's back.

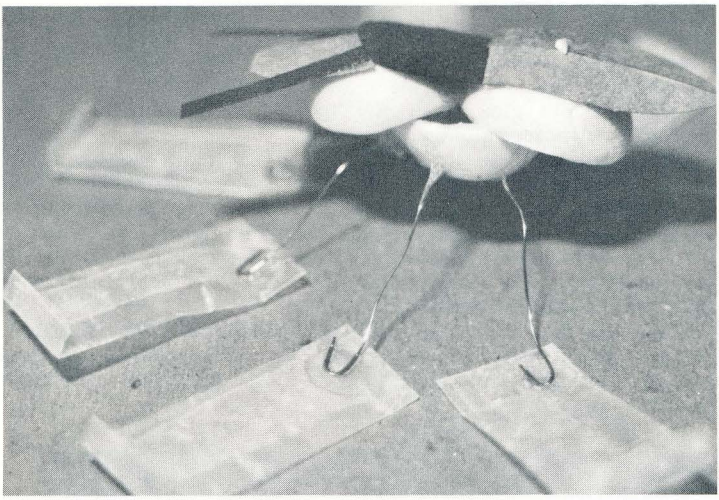


Figure 1. Model water strider.
(Photograph by Gary A. Dunn)

Notes for Use of Water Strider Model

The water strider model is a floating demonstration of how real water striders stay on top of the water.

To use your model: Fill a sink or bath tub with water. It doesn't need to be more than a few centimeters deep. Then, to protect your models' legs from rust, apply a thin coat of petroleum jelly. For permanent protection, paint the legs with rust-proof paint (such as rustoleum). Inflate the feet by gently blowing air into the unglued end and, then folding that end over about one half centimeter. Set its feet first into the water.

When you are finished, lift the model gently out of the water. Dry off the legs and feet with a tissue or soft cloth. Make sure that it is completely dry, the feet are deflated, and then put in a safe place.

Careful! The water strider model is very fragile!

If the model did **not** float:

1. Check to make sure that you inflated the feet **and** folded the ends.
2. Check if there are any leaks in the model's feet. Locate and stop with rubber cement or airplane glue.
3. Adjust the legs so that on a flat surface all six feet stand flat on the table, and the lowest body parts are at least on centimeter above the table top.
4. Check to make sure that there is nothing adding to the weight of the model.

Use of "Weight Lifter" (fig. 2): This is the model with the paper "basket" glued onto its back. It is used to test how much weight the model can carry. All you have to do is drop pre-determined weights into the basket. when the strider sinks, lower the weight. Continue this process until you have determined the lifting capacity of the model.

Simple Repairing: It is likely that with normal use you model could last a very long time, but it is also likely that you might need to do some simple repairs.

One of the most common "disorders" you model may encounter is feet falling off of the legs. This is also very easy to fix. Take a dab of **airplane** glue and put it on the was paper. Then place the foot down onto the glue. You do not need to remove old glue from the foot, this actually helps in gluing. **Make sure the foot is dry before gluing.**

To fix a foot with a leak in it. Just find the leak and plug it up with rubber cement or airplane glue (if you are having difficulties finding the leak, do the following: gently remove the foot from the leg; inflate the foot and force under water. Holding the folded-over end, tightly and gently squeeze the foot. Where air bubbles come out is where the leak is. Fix the leak and glue the foot back on). For bigger leaks or tears, cut a piece of wax paper slightly bigger than the hole and glue it on.

If one of the legs is wobbly going into the base, put a few drops of rubber cement onto the joint where it enters the leg. **Do not** use airplane glue, liquid rubber, Elmer's glue, or crazy glue. These glues will disintegrate the model body parts.

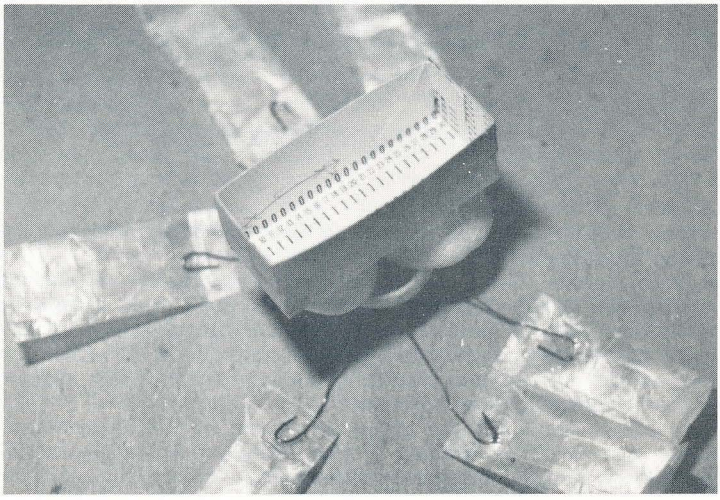


Figure 2. Model water strider, "weight-lifter" version (Photograph by Gary A. Dunn)

Comparison of Model and Insect

1. Model uses wax paper with air inside for feet. The wax paper helps the feet on top of the surface and the air adds the amount of lift of the foot.

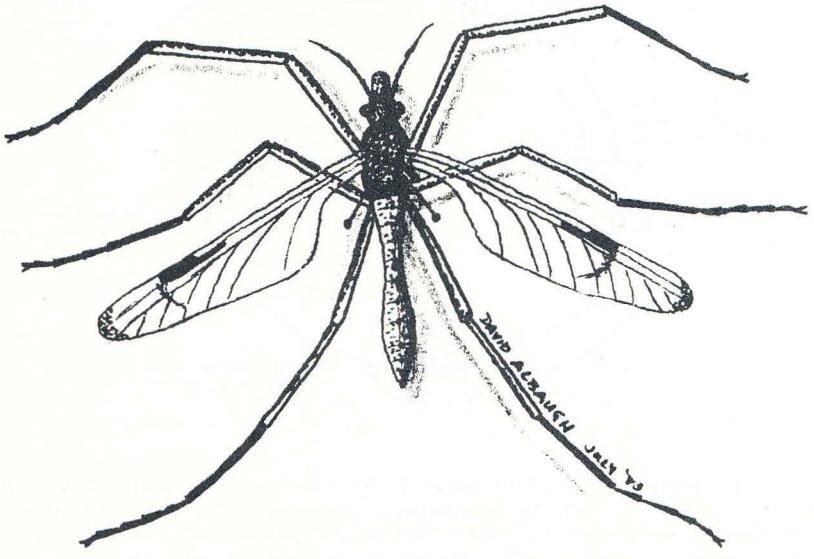
1. Insect uses water-resistant hairs that actually work so well that the insects' feet do not break the surface of the water at all. The hairs cross to form air pockets just in case the insect gets dunked.

2. The long legs keep the insect and model right side up in fast moving water. The way it works, is when a wave hits from one side the floating feet on the other side keep the insect afloat.

3. The sheer light weight of both the model and creature and help keep them on top of the water. Although, as shown on the above chart, they can support quite a bit more weight with their special equipment.

This research answers the questions about how the water strider stays on top of the water, but it also has one or two other applications. It demonstrates how an alternative to current models of aquatic vessels could be built, with more buoyancy for high winds and water, and for more speed, because of less drag due to underwater surface area.

Research material for this project included The Audubon Society Encyclopedia of Animal Life, published by Clarkson N. Potter.



Cranefly

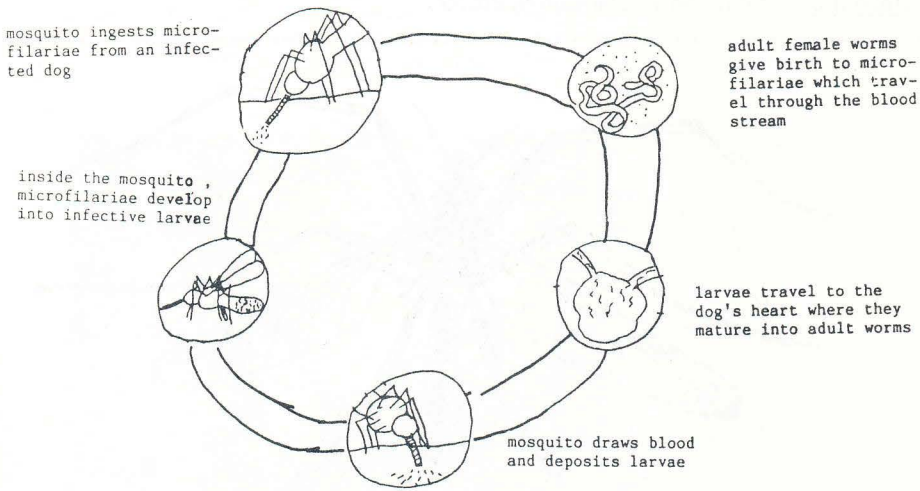
Illustration by David Albaugh
Jamestown, RI

MOSQUITOES AND HEARTWORMS: THE DEADLY LINK

Emily Brock
1227 Dartmouth Road
Madison, WI 53705 USA
(Van Hise Middle School)

A big problem in certain parts of the United States is the heart worm, a fatal parasite of dogs. Heart worms are transmitted from one dog to another by mosquitoes. It is the purpose of this article to present the life cycle of the heart worm and how it is linked with the mosquito.

The cycle begins when an adult mosquito draws blood from an infected dog. In the blood are tiny immature heart worms called microfilariae. In two or three weeks, these microfilariae will mature inside the mosquito to the larval stage. The mosquito then deposits the larvae into a healthy dog at its next blood meal. The larvae continue to mature in the dog and in about 200 days they become adult worms. The adult hear worms then travel to the right chambers of the heart and begin to produce microfilariae. The fully-grown female worms are as long as 14 inches and male worms grow to as long as 7 inches. At this length, the heartworms continue to produce microfilariae, as many as 5000 per day per heart worm. The heart worms increase the workload of the dog's heart and restrict blood flow. Eventually, the dog will die.

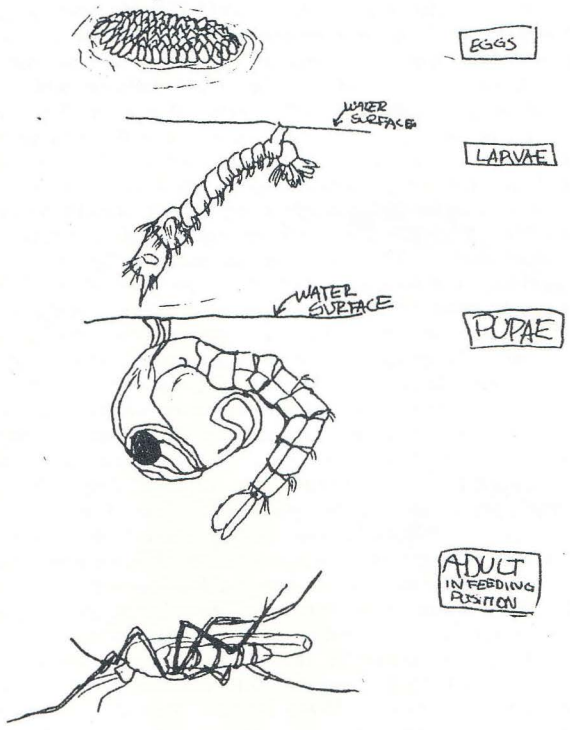


Obviously, there is a need to prevent this disease. The simplest way, it would seem, would be to kill the mosquitoes. However, this is not feasible because there are so many species (over 2500) of mosquitoes, and the pesticides used to kill mosquitoes may pose a danger to humans. Only in areas where the

mosquitoes cause serious human diseases, such as malaria, would the risks of mosquito control be worth it. Fortunately, there is a preventative medicine for dogs called diethylcarbamizine citrate. In areas where heart worms are prevalent, veterinarians recommend that dogs be given one tablet of this medicine each day during the mosquito season, April to October.

The mosquito is a slender, elongate insect with veined wings. The males have busher antennae than the females. The males feed on nectar and plant juices. The female, in most species, must feed on blood in order for her eggs to mature. She sticks her proboscis into a capillary of the dog and sucks out the blood.

Habitats of mosquitoes are swamps, rotted holes in trees, and the edges of large permanent bodies of water. Mosquitoes undergo complete metamorphosis. The eggs are laid on top of the water or on floating vegetation. The larvae and pupae are active and free-swimming in the water. In both of these stages, they get air by breathing tubes that reach to the water's surface.



The regions of the country which have lots of breeding places for mosquitoes are the places where dog heart worms is the greatest problem. Our study of entomology helps us to control one of the most serious parasites of dogs.

Brood Diseases of Honeybees and How to Control Them.

Tim Oaks
4725 LaFayette Drive
Madison, WI 53705 USA
(Van Hise Middle School)

Here is some information on brood diseases of honeybees for beekeepers so that they can be watchful and know how to identify and control them if they appear.

American Foulbrood. American foulbrood is caused by a spore-forming "germ" known as Bacillus larvae. Usually larvae and worker bees are the only individuals affected by this disease. Most larvae become immune to the disease 3 days after the egg hatches. SYMPTOMS: One symptom of the disease is a "pepper box" pattern in the hive, that is where some of the larval cells remain uncapped. Sometimes the caps will be sunken, broken or punctured. Larvae may turn color from pearly white to brown. Eventually the larvae turn into a gummy mass. American foulbrood spreads in the colony when nurse bees transmit the disease from larva to larva, or when honey is stored in cells formerly occupied by sick larvae, or when bees are exposed to contaminated beekeeping equipment. CONTROL: When American foulbrood is detected the affected colony should be destroyed by burning the hive. The burnt remains should be disposed of by burial.

European Foulbrood. This disease is caused by a "germ" called Streptococcus pluton. European foulbrood occurs throughout the world and in some areas it is considerably more serious than American foulbrood. European foulbrood is common in the late spring when the growth of the brood is at its peak. It generally subsides in the summer, but sometimes it may reappear in the fall. The disease spreads slowly with no apparent damage, but affected colonies are often seriously weakened. SYMPTOMS: European foulbrood also is characterized by the "pepper box" pattern, however unlike American foulbrood most of the larvae are killed before their cells are capped. The larvae also change color from white to yellowish and the larvae look undernourished. This disease is not always fatal to bee larvae. CONTROL: The colony should be re-queened. This helps accomplish two things: it gives assurance of a healthy queen and it provides time for the worker bees to remove the dead bodies.

Sac Brood. Sac brood is a filterable virus that is so small that it cannot even be seen with a ordinary light microscope. This disease affects the larvae and occasionally the pupae. Adults are immune to the disease. It is important to distinguish this disease from the other more serious diseases affecting bees. SYMPTOMS: This disease rarely reaches the stage were you see a "pepper box" pattern. The larvae do change color from pearly white to yellow, gray or black. The head is always the first to change color and become black. If you carefully examine the larvae you will see that their insides are watery and the skin is thickened a form a sort of sac (hence the common name for this disease). Very little is known about the methods of spread for sac brood, but some scientists believe it may be passed on through the food larvae are fed. CONTROL: Requeening may assist the colony, but most colonies are able to overcome this disease on their own.

HOW THE FIRST SUNGLASSES WERE MADE

A Story by:

Michelle Yokoyama
1825 NW Grant
Corvallis, OR 97330 USA

It all happened in a land that was very hot. The sun was shining brightly. It was so bright you could hardly open your eyes. A little girl named Ann was walking in the sun when she saw a wasp. She said, "Oh, I would love to have those wings. You can see right through them. They would make great sunglasses!"

"Oh, I know what I'll do. I will catch a wasp with my sling shot and make sunglasses out of those wings!"

And that is just what she did. She made herself a pair of great sunglasses and the sun never hurt her eyes again. And that is how the first sunglasses were made.

FIELD NOTES

This section is set aside for the publication of field notes and collecting results, as a service to the entomological community. Send your field notes, however long or short, to: Gary A. Dunn, Department of Entomology, Michigan State University, East Lansing, MI 48824-1115 USA. See YES QUARTERLY 2(3):16-17 for further information.

LOCALITY: USA, Oregon, Benton Co., McDonald Forest nr Corvallis.
DATE: 26 October 1985
COLLECTORS: Michelle Yokoyama and Mark Yokoyama (1825 NW Grant Ave., Corvallis, OR 97330 USA).
CONDITIONS: cloudy and warm; early AM after three days of rain.
SPECIMENS: Pleocoma spp. (rain beetle); 4 females buried in the ground; six males present, 3 in flight and 3 on the ground.

LOCALITY: USA, Virginia, Patrick Co., Fairy Stone State Park nr Bassett (southcentral Virginia).
DATE: from 7 July 1985 to 11 July 1985.
COLLECTORS: Pierre Belanger (806 Bellevue, Ste-Foy, Quebec, CANADA) and Paul Gagne (Amos, Abitibi, P.Q., CANADA).
CONDITIONS: collecting with a headlamp, generally from 9:30 PM to 1:00 AM on warm nights (varying from 65 to 75 F); specimens taken from leaf litter on forest floor on a hill behind our tent site and on a sloping horse trail.
SPECIMENS: CARABIDAE - Carabus limbatus (35), C. serratus (4), C. sylvosus (8), Evarthrus iuvenis (24), E. sigillatus (5), Pterostichus relictus (5), Pasimachus depressus (6), Platynus (Rhadine) caudatum (46), Sphaeroderus lecontei (5), Scaphinotus andrewsi ssp. (9), S. webbi (1), Dicaelus politus (5), D. teter (8), D. ambiguus (3), D. d. dilatatus (4), D. p. purpuratus (12) Cymindis americanus (2), Galerita janus (5), Harpalus pennsylvanicus (9), Pterostichus adoxus (2); CERAMBYCIDAE - Prionus laticollis (5 male); ELATERIDAE - Melanactes piceus (1).

LOCALITY: same as previous entry.
DATE: same.
COLLECTORS: same.
CONDITIONS: collecting with UV light traps (4) arranged in a 10 foot radius around sheets, from 9:00 PM to 1:30 AM during warm nights (varying from 65 to 75 F); hilly forest behind tent site
SPECIMENS: CARABIDAE - Megacephala virginica (2), Calosoma scrutator (1), Pasimachus depressus (1), Carabus sylvosus (1), C. limbatus (4), Morion monilicornis (3), Harpalus pennsylvanicus (7), H. caliginosus (3), Amphasia sericea (3), Notiobia terminata (12), Trichotichnus dichrous (4), Selenophorus opalinus (6), Anisodactylus sp. (1), Platynus decentis (4), P. cincticollis (3), Clivina bipustulata (2), Pterostichus chalcites (4), Chlaenius sericeus (3), C. emarginatus (5), C. tricolor (1), Dicaelus

dilatatus (1), D. teter (2), D. ambiguus (1), D. purpuratus (2), Apenes lucidula (9), Pinacodera limbata (15), Plochionus timidus (6), Calleida purpurea (3), Dromius piceus (7), Galerita janus (1); CERAMBYCIDAE - Orthosoma brunnea (5), Prionus laticollis (8 males, 2 females), Arhopalus rusticus obsoletus (2), Prionus imbricornis (1), Tylonotus bimaculatus (1), Psyrassa unicolor (9) Enaphalodes atomarius (4), E. refulus (65), Elaphidion mucronatum (3), Elaphidionoides villosus (3), Obrium rufulum (1), Smodicum cucujiforme (4), Aneflomorpha subpubescens (6), Hesperophanes pubescens (6), Knulliana cincta ochracea (1), Eburia quadrigeminata (2), Monochamus notatus (3), M. carolinensis (2), M. titillator (1), Goes tigrinus (1), Hebestola nebnulosa (1), Heteomis cinerea cinerea (2), Ecyrus dasycerus (2), Aegoschema modesta (2), Graphisurus fasciatus (2), Ceratographis biguttata (3), Amniscus collaris (2), A. sexguttatus (5), Astyleiopus variegatus (4), Lepturges confluens (6), Sternidius alpha ssp. (2), Leptostylus transversus transversus (1), Hippopsis lemniscata (1), Oberea myops (1), Distenia undata (2); ELATERIDAE - Lacon impressicollis (6), L. discoidea (2), L. avita (14), Conoderus lividus (12), Limonius griseus (9), Athous cucullatus (10), A. brightwelli (1), Limonius quercinus (4), Diprous soleatus (7), Dicrepidus palmatus (8), D. ramicornis (1) Anchastus binus (11), Ctenicera pyrrhos (3), C. aethiops (2), C. sulcicollis (1), Hemicrepidius memnonius (16), Elater abruptus (9), Parallelostethus attenvatus (3), Orthostethus infuscatus (2) Glyphonyx testaceus (3), Megapenthes rufilabris (18), M. limbalis (9), Ampedus medius (2), A. fuscatus (4), Melanactes piceus (2), Melanotus americanus (2), Melanotus sp (communis or near), M. hyslopi (5), Melanotus spp. (3 or 4 unidentified species). SCARABAEIDAE - Copris tullius (2), Geotrupes splendidus splendidus (1), Sericea spp. (unidentified sp.), Phyllophaga spp. (6 undetermined spp.), Trox spp.(6), Ateuchus h. histeroides (6), Diplotaxis atlantis (18), D. frondicola (9), Cyclocephala borealis (8), Pelidnota punctata (8), Pachystethus marginata (4), Dynastes tityus (5 females), & Xyloryctes jamaicensis (2 males).

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LOCALITY: USA, Michigan, Monroe Co., south of Erie (South Dixie Highway); shrubs along ditch between Sterns and N. Bevore Roads.
DATE: 22 December 1985
COLLECTORS: Gary J. Lovell and Ken Swartz
CONDITIONS: 30 F, cloudy, 1 inch new snow (1-3' drifts)
SPECIMENS: ORTHOPTERA - Mantes religiosa egg masses (10 - none collected); LEPIDOPTERA - Hyalophora cecropia cocoons (2 - both collected), Antheraea polyphemus cocoons (70 - 40 collected).

LOCALITY: USA, Michigan, Monroe Co., north of Erie (South Dixie Highway); shrubs along ditch between Sterns and Lotus Road.
DATE: 19 January 1986
COLLECTORS: Gary J. Lovell; James, Jimmy and Danny Cendrowski
CONDITIONS: 35 F, windy and cloudy; recent rain - no snow cover.
SPECIMENS: ORTHOPTERA - Mantes religiosa egg masses (7); LEPIDOPTERA - Hyalophora cecropia cocoons (1), Antheraea polyphemus cocoons (13 - collected 5).

BOOK REVIEWS

But Will It Bite Me?

Edith G. Bailes and Louis J. Lipovsky, 1984, Cardamon Press, Richmond, ME, ISBN 0-9611118-1-X, 110 pp., 5 1/2 x 8 1/2", Paper, #9.95.

This book is intended as a reference book of insects for children - and their grownups. It includes chapters on how insects live and grow, dragonflies, grasshoppers, praying mantises, spittlebugs, fireflies, ladybugs, mosquitoes, flies, blackflies, fleas, ants, bumblebees, and honeybees.

The general theme of the book is that insects are harmless, even beneficial, and if you take the time to learn about insects you will see that insects that bit, sting, or pinch only do so when disturbed or threatened. The authors carefully explain the difference between biting and stinging insects (different ends of the insect!), and about those insects that bite because blood is their food.

As you might expect, the text is written for the younger audience. The book is not intended to be extensive; instead it is intended as an introduction to the commoner members of the insect world.

Factually speaking I found the book to be 98% accurate. For example, according to these authors, blackfly females are reputed to "begin biting every living creature in sight". Certainly this is a slight exaggeration. The book contains a few other similar exaggerated generalities, but fortunately they do not detract from the overall usefulness or purpose of the book. Indeed, some people would probably accuse of me of nitpicking.

I think the organization and selection of the chapters could have been a little better. The information on hymenopterous pollinators (bumblebees and honeybees) is over-emphasized, even redundant. I would rather see the discussion of bumblebees dropped or abbreviated in favor of some discussion of any common wasp species (hornet, yellowjacket, or paper wasp). Any of these can be credited as important predators of insect pests. And, their papermaking talents are extraordinary. Also, since this book is intended to inform about potentially hurtful insects, I wonder if there might have been room for a brief mention of the velvet ants, Mutillidae (for safety sake, if for no other reason)?

Overall the book will help many youngsters and some adults learn the true story about some of our common insect species. For those children too young to read by themselves this book would make an excellent non-fictional "storybook" for reading aloud. This would make and entertaining AND educational family activity.

Gary A. Dunn, M.S., R.P.E.
Department of Entomology
Michigan State University
East Lansing, MI 48824-1115 USA

AUSTRALIAN SYSTEMIC ENTOMOLOGY: A BICENTENARY PERSPECTIVE

This book is a collection of papers presented at a symposium held in Canberra, Australia, on May 7, 1982; the symposium was convened by the Australian Entomological Society and the Division of Entomology, Commonwealth Scientific and Industrial Research Organization to celebrate 200 years of accomplishments in Australian scientific entomology.

The book consists of 7 "chapters", or individual presentations, each highlighting the contributions of many individuals to taxonomic and systemic entomology, Australia. The papers are assembled in a logical order so as to show how systemic taxonomic entomology in Australia got started, comments on its present status, and suggestions to shape the future. Specifically, the papers are: "Dramatis personae: an anecdotal account of some historical figures", "Landmarks in the taxonomy of Lepidoptera", "Taxonomy and applied entomology of Australian termites: a small order in perspective", "Systemics and ecology: reflections from the interface", "Genetics and insect systemics: retrospect and prospect", "Descriptive taxonomy: past, present, and future", and "Systemics: an integrating discipline in biology".

I especially enjoyed E. N. Marks' paper on the "founding fathers" of Australian entomology. It provided wonderful insight into the personalities and accomplishments (not always positive ones!) of those famous entomologists who influenced Australian systematic entomology in its early years. Of course, many of these individuals had a profound impact on other continents as well!

I was also impressed by R. W. Taylor's paper on descriptive taxonomy. His analysis of taxonomy as an ongoing process was refreshing. He had several excellent suggestions for increasing taxonomic "inputs" or progress, outside of the obvious ones of increasing public funds for taxonomists and museums. He advocates greater use of already available resources of personnel, institutions, and collectors, as well as increased use of modern technology (SCM and computers specifically) to make taxonomists more productive.

C.D. Michener's paper on integrating systematic entomology into systematic biology, makes a excellent summary for the book. He emphasizes the need to bring together the subdivision of biology; entomology being no exception, as there is much to be gained from closer ties to allied biological sciences and biological specialists. His views on the need for cooperation among systematists, and the importance of systematic entomology in applied entomology are most appropriate.

Overall I would say the book would be a useful addition to most libraries -- institutional, as well as the private libraries of serious amateur and professional entomologists. This book would probably not be appropriate for the general collector or entomological "hobbyist" because of the depth and complexity of some of the topics. But for any entomologist seriously interested in taxonomy and systematics, this 147 page book is just chock full of neat trivia, useful facts and principals, and thought-provoking comments opinions and ideas.

Two other facets of this publication deserve mention. I really like the simple, but highly appropriate cover illustration. The cover is unique because

it uses a series of proportionally-sized discs (and insect outlines) to illustrate the relations among the orders of Australian insects. At first glance it looks like abstract artwork, but closer examination shows it conveys a great deal of information about ordinal systemics, virtually without words! I also appreciated the extensive list of references that accompanied each article.

Each paper is capable of standing alone, but collectively they complement each other quite nicely. One of the nicest attributes of the book is that it really celebrates entomological achievement in general. Non-Australian readers will find that using Australia as the focal point (or case study) of this book does not diminish the usefulness or educational value to entomologists on other continents to re-evaluate, and to set goals for the future.

The exclusive U.S. distributor is International Specialized Book Services (ISBS), Inc., P.O. Box 1632, Beaverton, OR 97075, U.S.A.

Gary A. Dunn, M.S., R.P.E.
Department of Entomology
Michigan State University
East Lansing, MI 48824-1115
USA

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The Phasmid Rearer's Handbook
by Paul D. Brock
Amateur Entomologists' Society
Hanworth, England
1985, 41 pp.

The stick insects and leaf mimics which make up the Phasmid group have long fascinated students of entomology. In Great Britain, rearing these insects has long been a popular activity. For various reasons, it has not widely "caught on" among American hobbyists. This may be due to several factors including the difficulty in importing livestock, the lack of evergreen food plants, and perhaps most of all, the lack of a good source of information.

The Phasmid Rearer's Handbook will prove a welcome remedy for that lack of information. Paul Brock, a long-time TIEG, and now YES, member, has reared, collected, and studied Phasmids for over a decade. He's as close to an expert on this little-studied group as you can find.

The book goes into some depth, exploring the techniques needed to rear many exotic species. He deals with such details as how to identify ova of different species, how to get finicky nymphs to feed on unaccustomed food plants, and even different humidity requirements for different species. It is well illustrated with detailed drawings of many of the species, as well as various types of equipment needed. Besides rearing, the book also has sections on collecting and mounting specimens.

Although occasionally technical, this book is never too much so. It is easy reading and will provide an invaluable resource to those wishing to try their hand at rearing Phasmids, or who just want to learn more about them.

Copies are available for $5.00 from A.E.S. Publications, 4 Steep Close, Green Street, Green, Orpington, Kent, ENGLAND

William D. O'Donnell
3849 Kenwood Drive
Stow, OH 44224

Someone Saw a Spider: Spider Facts and Folktales. Shirley Climo, Crowell Publishers, New York, NY ISBN 0-690-04435-6 133 pp, hardcover, US $11.50
1985

I would say it's a fair assumption that most people in this world loathe spiders. At best, spiders are certainly misunderstood and unappreciated by the average person. Some of these grand misunderstandings are no doubt the basis for the folktales put forth in this book.

Literarily speaking, the most famous "storybook" spider in the United States is probably Charlotte (Charlotte's Web, by E.B. White). Readers of this book will be surprised to find out that there are many other famous spider personalities around the world. This book serves as an excellent introduction to these fascinating spider personalities from folktales told in different parts of the world. For example, you can read about spider lore in the form of a Greek myth, a Japanese story, an American Indian myth, an African fable, a Moslem legend, a Scottish legend, a Russian folktale, a Portuguese fairytale, and American folklore.

The book is also filled with assorted verses, poems, and sayings about spiders. For example, it is said that if a spider crawls into your pocket you will always have money! Or, if you kill a spider, a storm will surely follow.

From an acharologist's viewpoint, this book is not without factual information about spiders. There is information on how spiders live, and the role that they play in the natural world. This lends some balance to the book, and offers explanations for the origin of the folktales, beliefs and superstitions.

Two other features of this book deserve mention. The book is nicely illustrated with black and white drawings by Dirk Zimmer. This artwork definitely compliments the storylines. I also found the final chapter very interesting. It is entitled "Extras and Explanations" and it provides inside information into the stories and terms unique to country of origin. This helps the reader understand more about the cultural background of the folktales.

This book is intended for 9 to 12 years olds, but I found it to be interesting and entertaining reading, a nice change from heavy-duty technical reading.

Gary A. Dunn, M.S., R.P.E.
Extension Entomologist, USDA
Y.E.S. Advisor/Editor

Department of Entomology
Michigan State University
East Lansing, MI 48824-1115 USA

Kafer Mittel-und Nordwesteuropas. Jiri Zahradnik. Paul Parey Publishers,
Hamburg/Berlin, Germany ISBN 3-490-27118-1 498pp 20 x 13 cm, hardcover DM 58,-- 1985

Translated into English, the title of this book is "Beetles of Middle and Northwestern Europe". As you might have already guessed this book is written in German.

This field guide style book covers the beetle species that inhabit the European continent from Normandy (France) to the Swiss Alps and west to western Hungary and Finland. It also includes the British Isles and Iceland.

In some ways this book is similar to "A Field Guide to Beetles of North America" by Richard E. White (Peterson Field Guide Series, Houghton Mifflin Co., Boston 1983). It has introductory information on "What is a beetle?", collecting techniques, specimen preservation, and nomenclature. Family level identification is made through a simple key that is well illustrated with black and white line drawings. The main body of the book is a systematic presentation of common genera and species within each family. There is general background information on each family, and then details on the biology, seasonality, and distribution for the listed species. There is no key to species, but each species is illustrated in the full-color plates.

One of the outstanding features of this book are the 64 full color plates near the end of the book. Each and every species discussed in the text is illustrated. The illustrations are superbly done by Jarmila Hoberlandtova and Ivan Zpevak. These illustrations make the book valuable to any Coleopterist, regardless of any language barrier.

Gary A. Dunn, M.S., R.P.E.
Extensioin Specialist, USDA
Y.E.S. Advisor/Editor

Department of Entomology
Michigan State University
East Lansing, MI 48824-1115 USA

PUZZLES &GAMES

Can you find the complete beetle?
Find it and you will learn the name!

Puzzle by: Bobby Montgomery, Savannah, MO

Find these words: aphid, mayfly, honey bee, ant lion, ox beetle, morning cloak, polyphemus moth, american burying beetles.

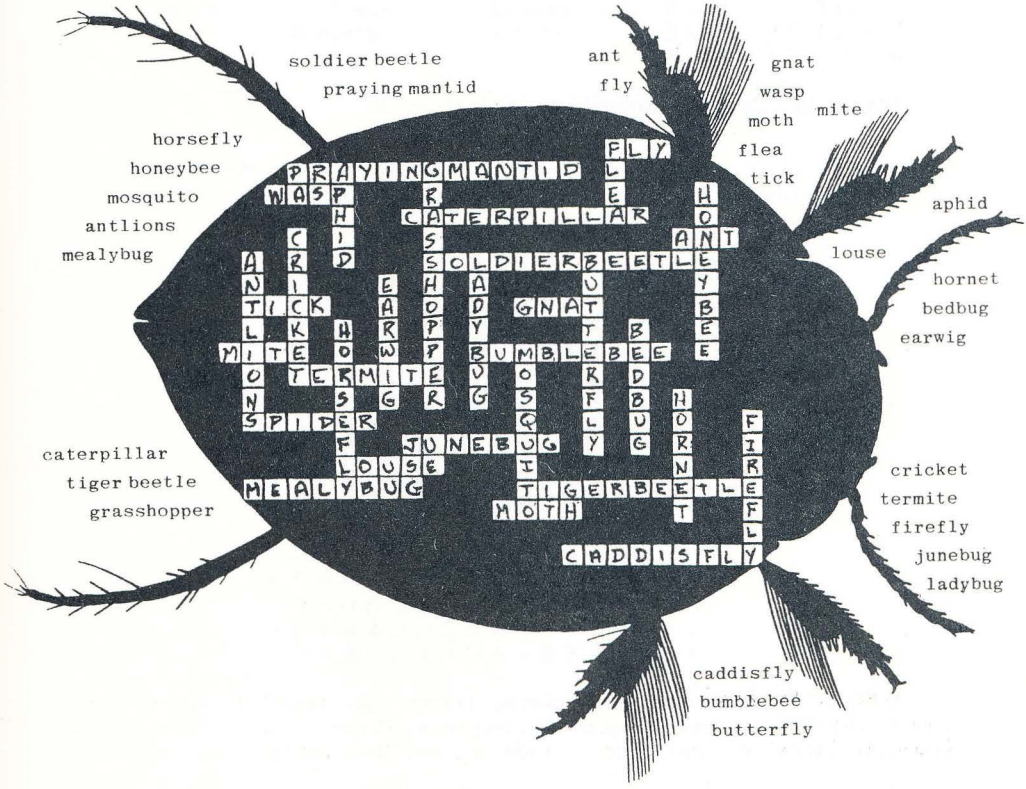
Words are down, across, upsidedown.

W F G Y B X Z O X F J L M K O D A E J J F C V B N N S A W R
D D G H S R G J K Y E G J E G I H C S N D M F D R X D A N E
D D S F W G P W J F J E A T D H N F F F E S G S H A H A H I
S A S E U W O D S S Q U D S E P D F F S J D G D E S S N H Y
V G T R F H L J N N O I L T N A G F D C X Z A Q D B H T H U
H K K N F X Y G J N B V C X Z K L P I Y T R E Q W S O L O P
J H F G D D P F N C X Z T E L P I O D R B N F D C N N L U G
B H T R F S H F G H J K L Z X C V B N M Q W R T Y P E D F Y
G K J Y V F E K J G G C A O E S U Z K A I F E A Y N Y G H H
V H S O U Y M O R N I N G C L O A K M N V G T U I R B Y E G
G J G J F E U I N I F T K G O D I A D I F G H J K Y E S S E
N J D E T H S H D A R A H W T A T Q U A R T O X B E E T L E
J K U J H H M N J S F H V B D I P L M B X W Z H K J N G D S
J H F R E A O D S E C L O A K K F S A K S R U E A Q U R G I
A S G R E W T N H G E J M G F V M I P Q X G F S A N G O I E
D D H C M Y H E W Q B U K F S B X M N H G F V X O I U T E H
F A M E R I C A N B U R Y I N G B E E T L E S L S H X B T R
S H K U G J F N W T P L B F E L M D V T E N Q Z F N R I C L
D F G H H H K E B X Y L D T W A B X K Y M A Y F L Y N U W S
V V G H T Y S N K Z W F L T Y S Z B V C S J I T E Q F C V B

Richard Dee Hansen
2755 Heritage Ave.
Boise, ID 83709

Winter Issue puzzle solutions

The cryptogram quotation was: "The Young Entomologists' Society has something for everybody!" Gary A. Dunn



FLY TRAP

Hidden below are the common names of 22 flies (order Diptera). The names may appear in any order: horizontally, vertically, diagonally, and even backwards. Try to find the flies if you can !

```
R E E D C D S H M F
A J B L O U C E O R
P M B O K N L R S U
T I R F T G U O Q I
S D E R O H S B U T
O G N A T M I B I H
L E N A R C I E T O
D M U S C I D R O R
I B O F L E S H G S
E A G T B L O W N E
R T A C H I N I D F
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Flies in Puzzle

bat	bee	blow
bot	clusiid	crane
deer	dung	flesh
frit	fruit	gnat
horse	louce	midge
midge	mosquito	moth
muscid	robber	shore
soldier	tachinid	

Puzzle by: Donald Baumgartner, Palatine, IL

WORD SEARCH

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T O S I L V E R F I S H H A B U G S
D H R D R P T R U E A T A N O D O Y
H S Y T O O H A N B S G D R A L N M
E T O S H L A N H T T U R D L A E E
M I R H A O N C A R I C A L E C U N
I N E C A N P D H U N S G A P E R O
P K P O L P U T O E K D O D I W O P
T B P C D U O R E B E D N Y D I P I
E U O O O T C C A R B R F B O N T E
R G H M P L O G M U A A I U P G E R
A S O E D A E A C G U G Y G T F R A
Y T P T B I N O T I G O T G E P A H
L I P O T T P O D E S N A A R C G O
F C A U E R C T O I A F P W A A B M
F K R R O N C G E S E L O A O N D O
L Y A M O T H A C R D R G S R T I P
H O M O P T E R A O A Y A P A E P T
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WORD LIST: Thysanura, Orthoptera, silverfish, stinkbug, Hemiptera, roach, Dermaptera, wasp, hopper, Coleoptera, Diptera, moth, Hymenoptera, Odonata, lacewing, Lepidoptera, ladybug, and Neuroptera

Puzzle by: David Woodson, Madison, WI

WORD SEARCH

M E T A O R N P H I S M N
P B A L D Y W I N S N I C
U X O N M P A U P M E T O
P R A P M O R P H I S E M
A D H S P R I C L A S D P
A R T H R O P O D S A G G
B G E R O T I S O P I V O
D M E T A M O R H I S O O
O A R F R O P O D R H V N
M D H A N T A N N A D I D
E U H E L X O L A C E P E
N L A R A P A V A L R A Y
A F D R O D R T E E E S E
A H O V T A U V T S G S S
E H O H L L O C T C X G G
T I S A C T E C E L O E S
O V I P O S S S O I U E N
L R V A N N N N O N A D H
B R I I I I A N T E N N A

Words may appear horizontally, vertically, diagonally, forwards and backwards.

WORDS TO FIND: abdomen, adult, antennae, arthropods, head, insects, larva, metamor(phos)his, nymph, pupa, eggs, ovipositor, thorax and spiracles.

Puzzle by: Shalini Rana, Madison, WI

WORD SEARCH

C B T M Q H J R L P V M Q
W A E O R T H O P T E R A
R T S Y D U I O U P A D S
F G H T J O K L P Z X C V
B N M G E Q N E A R A T X
Y L U I O P A A S D R F G
H B J K L X Z C T V E B N
M Q W E R T Y E I A T O P
A S D F G H J K L Z P X C
R P U B N M Q W E R O P Z
E T H Y M E N O P T E R A
T Y U I O P A S D F L G H
P Q W E D R R Y O U O O P
I A S D F G H J K L C V B
D F G H J K L Z X C V B N

DIRECTIONS: Find the words listed below. They could be backwards, sideways, diagonal or forwards. Good luck!

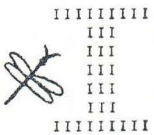
WORDS TO FIND: Aphid, bug, Diptera, pupa, Orthoptera, Odonata, Hymenoptera, Coleoptera, and caste.

Puzzle by: Heidi Meier, Madison, WI

CRITTER CRAZINESS

Katie Mrazek
316 Virginia Terrace
Madison, WI 53705 USA

The words in the right column are correctly spelled. Unscramble the words in the left column so they match the words in the right column.

eaplofhres		silverfish
anomhcr		hornet
bheoneye		aphid
thraorpdao		lacewing
tohm		leafhoppers
lyf		thysanura
btelee		monarch
nta		honeybee
feleydr		arthropoda
yhtnasrua		moth
eptohorahm		dragonflies
inwlgcea		fly
phdia		beetle
terohn		ant
hisslviref		deerfly

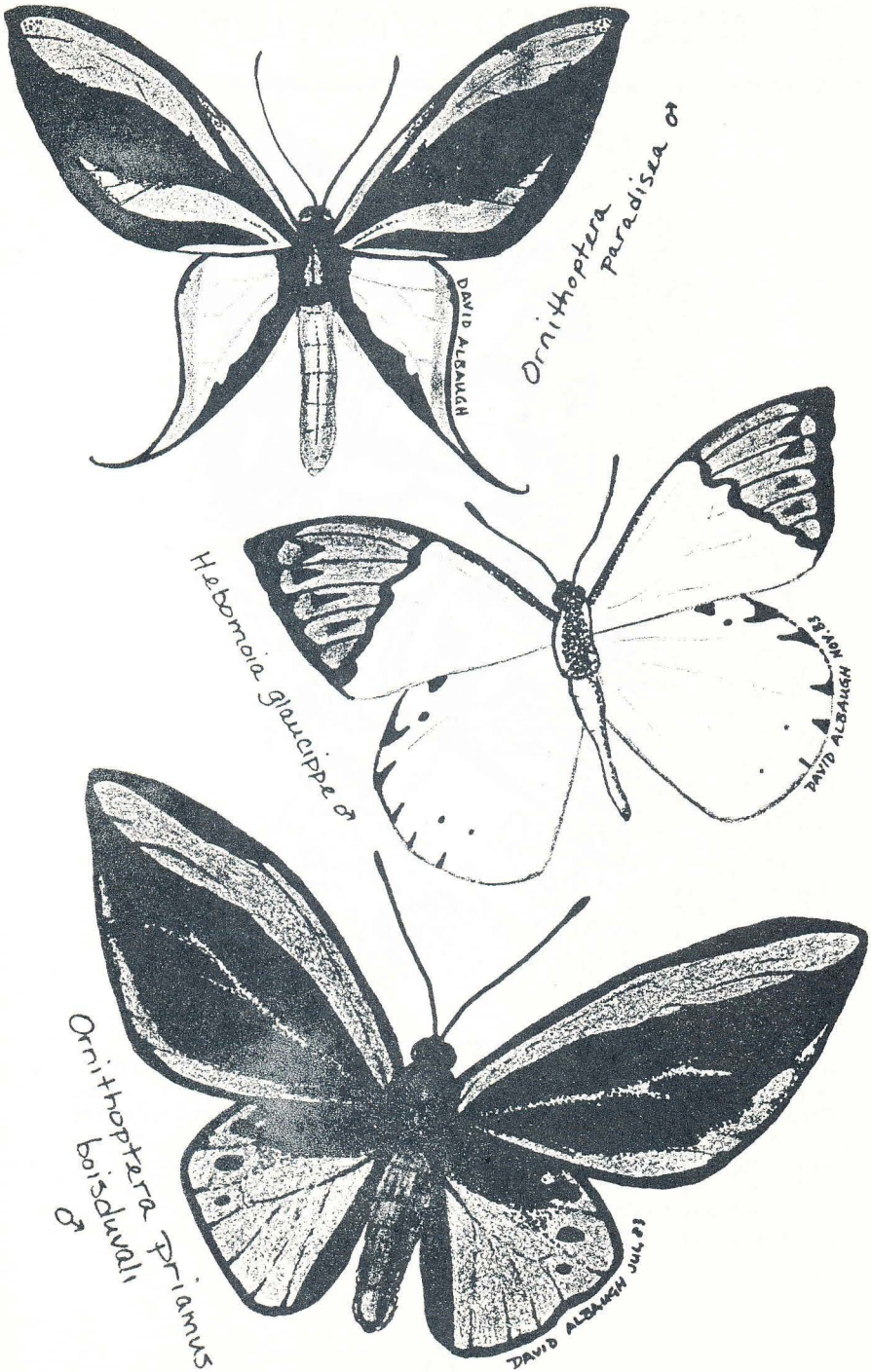
Kara Schrader
4617 Gregg Road
Madison, WI 53705

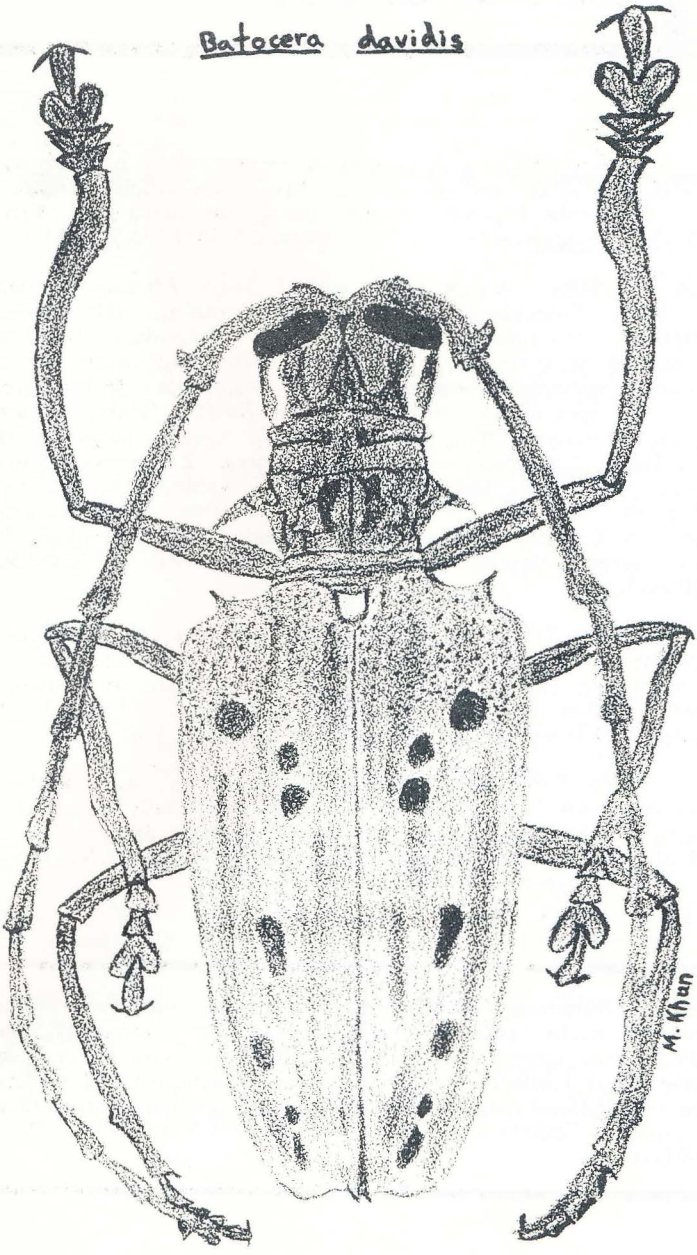
Van Hise Middle School
Grade 7

INSECT ILLUSTRATIONS

The Great Spangled Fritillary (Speyeria cybele): This fritillary, with a wingspan extending from 2.15 to 3 inches, is one of the more common fritillaries in North America, usually found in the east from southern Canada to northern Georgia in the United States. The caterpillar feeds on violets only at night. It overwinters soon after hatching from its egg in late August and September. There is one brood from June to mid-September. The great spangled fritillary can be observed as an adult from mid-May to October, and is especially fond of nectar from thistle and milkweed, and sap from trees, and rotting fruit.

Lisa Resotko, Towaco, NJ


Ornithoptera paradisea ♂
DAVID ALBAUGH
Hebomoia glaucippe ♂
DAVID ALBAUGH NOV '83
Ornithoptera priamus boisduvali ♂
DAVID ALBAUGH JUL 83


Batocera davidis
M. Khan

TRADINGPOST

Wanted: Correspondence with retired entomologists with background in tropical Lepidoptera and Hemiptera. Also, I am willing to share some native California Lepidoptera with young entomologists. Write to: Dr. Joe Vredenburgh, 6656 Trigo "B", Goleta, CA 93117 U.S.A. (3/1)

Collection for Sale: Large collection of South African Lepidoptera, also some Coleoptera, Diptera, Hymenoptera, and Homoptera. Butterflies: Danaidae, Acraeidae (41), Salyridae, Nymphalidae (60-includes separate spp.), Charaxes (100), Papilionidae (60 spec.), Pieridae, Libytheidae, Lycanaenidae, and Hespenidae; Moths: (represent almost all species in southern Africa) Swifts, Goats, Clearwings, Loopers, Hooktips, Silks, Emperors (100), Eggars, Monkeys, Hamks (120), Tigers, Tussocks, owls and many others. 220 specimens in other orders. Prefer to sell collection as a whole, but will consider selling all butterflies, all moths and all other orders as separate unites. Best offer. For information or bids, contact Mr. P.G. Woods, 8 Parker Gardens, Merritt Ave., Warner, Beach, 4125 REPUBLIC OF SOUTH AFRICA (3/10

Wanted: Phasmida (stick and leaf insects). Livestock and deadstock. I specialize in this order, and in particular seek Timema species from California and other areas (eggs). I can purchase or exchange for Phasmida other orders. All letters answered. Paul D. Brock, "Papillon", 40 Thorndike Rd., Slough, SL 2 1 SR. ENGLAND. (3/1)

Wanted: Butterflies and Coleoptera, especially scarabaeidae and Lucanidae, from Central and South America, especially Columbia, Peru, Bolivia, or Venezuela. I would prefer to buy, rather than trade. Send all lists/letters to Tetsuo Nawa, The Nawa Insect Museum, Gifu Park, 2-18 Ohmiya-cho, Gifu City, JAPAN (3/1)

Undergraduate Entomology Scholarship: In keeping with their interest in increasing public awareness and support for entomology, BioQuip Products, Inc. sponsors an annual $1,000 scholarship for a deserving undergraduate (college) student. Further information and applications (June 15 deadline) may be obtained by writing to Executive Director, Entomological Society of America, 4603 Calvert Road, College Park, MD 20740 (3/1)

Help Needed: A small library at a USDA sponsored research center in Saudi Arabia has notified Y.E.S. that they would be very appreciative of a donation of any entomology books or periodicals. They are in dire need of many out-of-print books (especially Coleoptorum Catalogue, 1910-1940, The Hague) on taxonomy, biology an the like. They would also be interested in corresponding with taxonomic entomologists who might be able to assist with various Saudi research projects. To make donations, or for further information, contact Dorothy Jessop, USDA/OICD, Room 4103 Auditors Bldg., Washington, DC 20250 (202) 475-4190. (Ed. Note: They are now receiving all Y.E.S. publications.) (4/1)

Wanted: Willing to identify, exchange or purchase buprestids on a worldwide basis. Please contact: Dr. Stanley Wellso, Department of Entomology, Michigan State University, East Lansing, MI 48824-1115 U.S.A. (3/1)

Wanted: Citheronia regalis and Antheraea polyphemus, to buy. Send prices to Jerry L. Day, 1201 Withington, Medford, OR 97501 U.S.A. (3/1)

For Sale: Philippine insects--dried and papered specimens. Please contact Elizabeth Lumawig, P.O. Box 2684, Manila, PHILLIPPINES. (3/1)

For Sale or Exchange: Butterflies and moths, also some odd insects, I collected in New Zealand last winter. Also, Lepidoptera from North America, Europe and Japan, including several much-sought western species and subspecies. John Reichel, P.O. Box 789, Revelstoke, British Columbia, VOE 2SO, CANADA (3/1)

For Sale: Sphingidae, Nymphalidae, Saturniidae, Helioconidae, ithomid sp., Caligos, and Morphidae. Also, Automeris, sp., Euchroma gigantea, Titanus gignateus, Harlequin, long horn beetles, Megasoma elephas, golden scarab and others. Darien Compound Safaris, P.O. Box 909, Panama 9A, REPUBLIC OF PANAMA. (3/1)

Wanted: Livestock of Saturniidae and Ceratocampidae. Send price list to: Jeff Miller, 550 Conifer Way, Ashland, OR 97520 U.S.A. (3/1)

For Sale: The rarest Rhopalocera from Reunion Island (near Madogascar). Quality A1, papered, named. **For Exchange:** Insects from Reunion, all of A1 quality, named with data. **Wanted:** Morpho, Papilio, Agrias preforia, Saturniidae, Danaidae, Ornithoptera, Troides, Dynastinae, Lucanidae, Goliathidae, Buprestidae, Phasmidae--top quality, papered and with complete data. ALSO, willing to offer information, publications, and identifications on insects of the madagascerene area. T. Claude Anderes, 18 Residence Caravelle, Blve. de la Providence, 97400 St. Denis, Ile de la REUNION (FRANCE). (3/1)

For Sale: Large selection of papered Malaysia Butterflies, beetles, and other insects, all of A1 quality with date. Free catalog available from: Deco Enterprise, P.O. Box 155, TAIPING, Malaysia (2/4)

Help Available: To Y.E.S. members, ages 17 and up, collecting in the vicinity of Oviedo, Florida, northeast of Orlando. Housing, microscope, and library available with local Y.E.S. member. For more information, contact the Y.E.S. Trading Post. (2/4)

Wanted: California Academy of Science Insect drawers, cabinets, or unit trays; determined insect specimens (any group); and journals, books and reprints from College of Idaho Museum of Natural History. Send materials to: William H. Clark, Assistant Director, Museum of Natural History, College of Idaho, Caldwell, ID 83605. ALL CONTRIBUTIONS ARE TAX DEDUCTIBLE! (2/4)

Wanted: Copy of the Butterfly Book by W. J. Holland. Most recent edition preferred, by not necessary. Will buy for a reasonable price. Kent Hudson, Box 85, Hinsboro, IL 61930 U.S.A. (2/4)

For Sale or Exchange: Many insect orders from the Southeast U.S., including cecropias, Dianas, stag beetles and cicada killers. Quantities very limited. Write for complete details. Bryan Belay, Rt. 1, Box 291, Pearisburg, VA 24134

Wanted: Information and advise on giant silk moth (cecropia, promethea, polyphemus and luna) mating behavior and male assemblages. Also, suggestions for a reference for identification of North American mantids and other Orthoptera. Gary J. Lovell, 3818 Watson, Toledo, OH 43612 U.S.A (3/1)

Wanted: Deadstock (specimens) of any insect for life-cycle displays. Any size acceptable, but must be in reasonable condition; this includes cocoons, pupae, larvae, immature insects (prefer Lepidoptera, though). Willing to buy/trade. Ryan Bridge, 4329 Old Orchard Road., York, PA 17402 U.S.A. (3/1)

Exchange Wanted: Will exchange Cicindelidae and other insects from New York state and New England for any part of the U.S. or world. All letters will be answered. Michael A. Valenti, 135 Jamesville Ave., Syracuse, NY 13210 U.S.A. (3/1)

Wanted: Information on rearing Acherontia atropos, Deathshead Hawk moth (Sphingidae). Also interested in obtaining livestock of this species. Write to: Randy Robinette, 7302 Midland Trail Rd., Ashland, KY 41101 U.S.A. or Call: (606) 928-3401.

Free Publication: "A Planting Guide for Virginia Nectar-Seekers" by Patricia M. Purdy (a Y.E.S. member) and Jeffrey M. Curtis (Wildlife Education Coordinator for State of Virginia) and published by the Virginia Non-Game Wildlife Fund. This 18 page pamphlet is packed with information for attracting birds and butterflies. Send requests to: Young Entomologists' Society, Department of Entomology, Michigan State University, East Lansing, MI 48824-1115 U.S.A. (3/1)

Wanted: Individual(s) interested in exchanging bulk beetle samples from blacklight traps. This could be easily run in the same fashion as the Y.E.S. Swap Box program. Write to Gary A. Dunn, Department of Entomology, Michigan State University, East Lansing, MI 48824-1115 U.S.A. (2/4)

Wanted: Livestock of the Buckeye, Junonia (Precis) coenia. Willing to trade or buy. Contact Kathy Miktuk, RD #1, Box 119, Panama, NY 14767 U.S.A. (2/4)

Exchange: Lepidoptera (worldwide), especially Nymphalidae and Pieride; also other families--Hesperiidae, Papilionidae, etc., and Coleoptera (worldwide), especially Cerambycidae and Scarabaeidae. All letters welcome and answered. Luis R. Perez, HC 02 Box 18881, San Sebastian, Puerto Rico 00755 U.S.A. (2/4)

Wanted: Cerambycidae from all over the world in exchange for specimens from Europe and the Soviet Union. Elvira Barchet, 6470 Clybourn Ave., #242, North Hollywood CA 91606. U.S.A. Telephone (213) 761-3764. (2/4)

For Sale or Exchange: Cocoons of A. luna, A. io lutheri, and C. promethea. SASE for prices. Will also accept desirable papered butterflies with data in exchange for cocoons. Larry J. Kopp, R. Box 30, Klingerstown, PA 17941. (2/4)

For Exchange: Will exchange many species of butterflies from Mayalasia, Phillipines, Taiwan, some from Africa, Peru, Brasil, and Europe, all in A1 quality, for A1 specimens from other countries (USA, Canada, Central America, South America, Australia, Indonesia, India, etc.). Exchange preferred, but can also buy. Please write to Patrick M. Malesieux, 87, rue Delhaye 59 148 Flines les Raches, FRANCE, (2/4)

To Exchange or Purchase: N.A., Neotropical Lepidoptera ova, pupae and cocoons. Offer in exchange fine exotic material. M. Zappalorti, Sr., 123 Androvette Street, Staten Island, NY 10309 U.S.A. (2/4)

Wanted: Worldwide Cicindelidae in trade for worldwide Lepidoptera. Willing to give several different or same species depending of type of Cicindelidae. All letters welcome. Contact: Ryan Bridge, 4329 Old Orchard Rd., York, PA 17402. U.S.A. (2/4)

Wanted: Information on how to receive Atticus atlas formosanus ovae, larvae, or pupae. Contact: Ryan Bridge, 4329 Old Orchard Rd., York, PA 17402. U.S.A. (2/4)

Wanted: Cicindelidae and Carabidae (Carabus, Cychrus, Scaphinotus, Calosoma, Anthinae only) species and literature. Worldwide beetles available of all families. Cesare Iacovone, Via G. Noventa #12, Scala I--int. 3, 00143, Roma, ITALY. (2/4)

Wanted: Live larvae of any tiger beetles and live true katydids, both female and male. Will pick up anywhere any pay for the catch and phone call. Glenn Firebaugh, 3636 Hoiles, Toledo, Ohio 43612. U.S.A. (419) 478-8312. (2/4)

For Sale or Exchange: All orders of insects from Israel, especially Diptera and Hemiptera. Write for details. Izhak Nussbaum, Nahalat zvi 35, Petack-Tikva 49421, ISRAEL. (2/4)

For Sale: Many butterflies, beetles and other insects from all parts of the world. Write for main list and supplementary list every month. FOR EXCHANGE--same for many rarest insects and others. Send your offer. WANTED--all information regarding breeding of Goliathinae, Dynastinae and other Scarabaeidae. Also, we research living material like Dynastes hercules, neptunus, megasoma, Goliathus, etc. Gerald Pelissie, "Les Granges Noires", 01660 Chaveyrait, FRANCE. (2/4)

Wanted: Exchange of Coleoptera, especially Cerambycidae (worldwide). Many types of beetles available from different regions. Gontran Drouin, 50 Principale, Ste.-Henedine, Quebec, CANADA G05 2RO. (2/4)

Wanted: Ovae and pupae of the Lepidoptera, especially Saturniidae, Papilionidae, and Nymphalidae. Willing to buy. Send lists and prices to: David Aibaugh, 9 Columbia Avenue, Jamestown, RI 01835 U.S.A. (2/4)

For Sale: Worldwide collectible butterflies, beetles and rare insects, names with data. For subscription to butterfly and beetle price lists send $5.00 to Ianni Butterfly Enterprises. P.O. Box 81171, Cleveland, OH 44181 U.S.A. (2/4)

For Sale: Neotropical insects from northen Central America, or will **Exchange** same for Catocala (Lepidoptera: Noctuidae) especially from Europe, N. Africa, USSR, Central Asia, China or Korea. Also, SELL glassine envelopes in three convenient sizes; take fountain pen and stamp pad ink well. Eduardo C. Welling M., Apartado Postal 701, Merida, Yucatan, MEXICA (2/4)

Exchange or Purchase: Cicidelidae and Carabidae worldwide. All letters answered. Gary A. Dunn, Department of Entomology, Michigan State University, East Lansing, MI 48824-1115 U.S.A. (2/4)

For Sale: Handbook of Insect Rearing, Volumes I and II edited by Pritnam Singh and R. F. Moore. This publication provides a practical guide for those who wish to rear insects for the first time. It is a do-it-yourself book, written in a simple logical style. 474 pp. US $77.75. Available from Elsevier Science Publishers, P.O. Box 1663, Grand Central Station, New York, NY 10163 U.S.A. (2/4)

For Sale: Elefant brand insect pins. Send SASE for prices. Thomas Greager, R. D. #6, Box 56-B, Greensburg, PA 15601 U.S.A. (2/4)

For Sale or Exchange: Reorganized my personal collection and must sell 952 unsorted general insects for lack of space. All are pinned and labeled, in good to fine condition. 1/3 from Peru (S. Amer.), the remainder from Illinois (USA). Entire lot for US $50.00 or best offer; or, exchange for Calliphoridae. Donald Baumgartner, 150 S. Walnut St., Palatine, IL 60067 USA (3/2)

Wanted: Copies of the books: "Mosquitoes - Their Bionomics and Relation to Disease" by W. Horsfall (1955); "Myiasis in Man and Animals of the Old World" by F. Zumpt (1965); and "The Mosquitoes of Canada" by D.M. Wood et al. (1979). Will pay a reasonable price and shipping costs. Donald Baumgartner, 150 S. Walnut St., Palatine, IL 60067 USA (3/2)

Expeditions Available: 17 day collecting safari in Panama. Low, medium and high elevations; virgin rain forests. First class accomodations at hotels and mountain resorts. Space is limited, make your reservations early. Supervision for teens and handicapped persons. 1986 departure dates from Panama: May 12 to 28th; August 11 to 27th; and November 10 to 26th. Write for brochure and reservation forms: Darien Compound Safaris, Lyle C. Armstrong, Ph.D., P.O. Box 909, Panama 9A, REPUBLIC of PANAMA. Tel.: 55-7272 (3/2)

Wanted: Markets for informative articles on insects and spiders, illustrations, and editorilas on wildlife and environmental issues. Cartoons, too. Eric R. Eaton, 2310 S.W. Bertha Blvd. Apt. 5, Portland, OR 97201 USA. (3/2)

For Sale: A1 papered Central and South American Prepona. A wide selection. Also sell African Charaxes and various Nevadan butterflies and large and medium Dynastinae. For a free list, write to: Mark Khun, 1245 Conway Lane, Reno, NV 89503 USA (3/2)

PUBLICATIONS FOR EXCHANGE: I have a large number of duplicate reprints and photocopies of articles on Coleoptera (mostly Carabidae and Cicindelidae) which I would rather not throw away - they need a good home! I would be willing to accept any reasonable offer of specimens (Carabidae or Cicindelidae) or other literature. A free list is available upon request. Gary A. Dunn, Department of Entomology, Michigan State University, East Lansing, MI 48824-1115 USA. (3/2)

For Sale or Exchange: Giant flower-loving flies (genus Rhaphiomidas), various species, size 20 - 30+ mm. Also, Mydas fly (Neomydas pantherinus). Many other large, rare Diptera from western USA, some with empty (but perfect) pupal case. S.A.S.E. for prices. Will exchange for other large Diptera (20 mm & up) worldwide. Contact: Rick Rogers, 2630 Palm Drive, Hermosa Beach, CA 90254 USA. (3/2)

For Sale: Worldwide distributor of superior quality entomological supplies books and living material. Send US $1.00 for catalog. We specialize in prompt, courteous service. American Biological Supply Co., 1330 Dillon Heights Ave., Baltimore, MD 21228 USA. Phone (301) 747-4500 (3/2)

Wanted: Coccinellidae, worldwide. Will purchase or exchange. Send offer to: Francesco Isgro, 2002 Wellfleet Court, Falls Church, VA 22043 USA (3/2)

For Sale or Exchange: Black-winged damselflies, Calyopteryx maculata (males and females) with complete data. Interested in offers from anywhere in world. Contact: David C. Patten, General Delivery, Peace Valley, MO 65788 USA All letters answered. (3/2)

Wanted: Male and female specimen of the black witch (giant noctuid). This species is primarily tropical but does wander north to Canada; it is a pest in Hawaii. Write to: David C. Patten, General Delivery, Peace Valley, MO 65788 USA (3/2)

For Sale: Many kinds of insects, for scientific studies or just for collections; named or unnamed, lots or single specimens, pinned and labelled or papered. Collections are named, pinned and labelled. WANTED: Tenebrionidae from arid areas of South America (only) such as: Patagonia, high Andes ranges, etc. EXPEDITIONS: to any area of South America to collect, study or photograph insects. Vacancies for two people and gear in a camper. 40 years experience. Send inquiries to: Luis E. Pena G. P.O. Box 2974, Santiago, CHILE. (3/2)

For Sale: Formosan butterflies, moths, beetles and other dried insects. Also, live coccoons and ovae of moths. Write to: P.T. Chang, P.O. Box 873, Taipei, Taiwan, REPUBLIC OF CHINA. (3/2)

Available: Updated, 12-page spring catalog. If you have never seen our catalog, don't miss it! Bargain packed, butterflies for collectors, beginners and frame-makers. Rare, seldom offered material listed. (Parnassius list on request.) Send US $1.00 cash/check for catalog (or $6.00 for a year of catalogs/newsletters issued every 5 weeks). Write: Transworld Butterfly Co. (YES), Apartado 6951, San Jose, COSTA RICA (Central America). (3/2)

For Sale: Worldwide Lepidoptera, also some Coleoptera. Top quality papered specimens, with complete data. Good prices. Satisfaction guaranteed. Also for sale: Elephant-brand insect pins, and the books "The Illustrated Encyclopedia of the Butterfly World" by Smart and "Butterflies of the World" by Lewis. Send US $1 and legal size SASE for pricelist. Your $1 refunded with first order. Thomas Greager, R.D. #6, Box 56-B, Greensburg, PA 15601 USA. (3/2)

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